

**AMPEX**

1800550

**FR-1800 L**  
**Recorder/Reproducer**  
**Operation and Maintenance Manual**

**AMPEX**

1800550-10

REVISION NOTICE

This revision supersedes Technical Manual

Number 1800550-01 , dated 1 AUG, 1966.

Superseded pages are to be destroyed.

# FR-1800 L Recorder/Reproducer

## Operation and Maintenance Manual

ISSUED: 1 MAY 1967

Note: Asterisk denotes pages affected by latest change.

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## **NOTICE**

Only proper use will produce the high performance and reliability for which your Ampex equipment was designed, built, and tested. In order to be sure that you obtain the best possible performance and reliability, please DO NOT:

- INSTALL or CONNECT,
- OPERATE,
- ADJUST or ALIGN,
- MAINTAIN, or
- REPAIR

the equipment without first consulting the applicable portion(s) of the manual.

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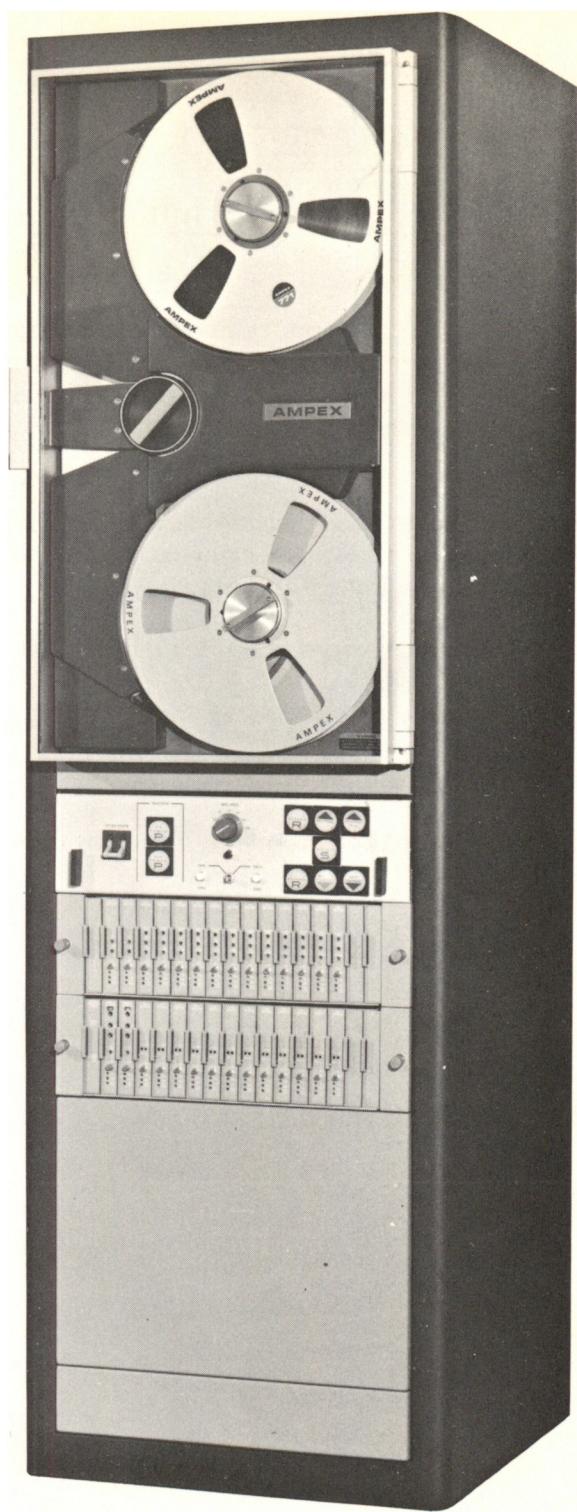
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**IMPORTANT****AMPEX FIELD ENGINEERING BULLETIN SERVICE**

Ampex provides a continuous Technical Support program for its products. This program is implemented through Field Engineering Bulletins which are published by the Ampex Technical Support Group. Approved modifications, information on special tools and accessories, and improved operating and maintenance techniques are typical of the information distributed in these bulletins.

This service is offered without charge and is extended to all end users of Ampex Equipment. If you are not receiving Field Engineering Bulletins at this time you will be placed on the mailing list upon receipt of the following information:

1. The Ampex Model Number of your equipment.
2. The Final Equipment or System Serial Number.
3. Your Company name and complete mail address.
4. The person or department to whom the bulletins should be directed.

Mail the above information to:

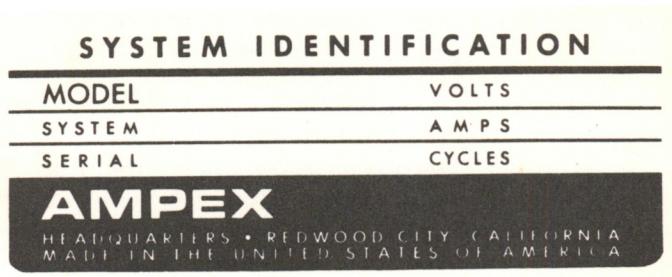
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U. S. A.

Attn: Technical Support Group  
M. S. 4-10

Note this service is world wide.

## COMMUNICATING WITH AMPEX FOR SERVICE AND REPLACEMENT PARTS

Your Ampex equipment is identified by a red System Identification nameplate. Our Parts and Service Department maintains a record of your equipment according to the numbers shown thereon. The nameplate will appear in the form illustrated below.



When requesting service and replacement parts, please identify your equipment by the information shown on this nameplate, being careful to include the model number, system number, and serial number.

The term cycles, and the abbreviations cps, kc, and Mc will be noted variously on the nameplate, placarding, and drawings. All narrative within this manual, however, will express frequencies in Hertz, employing the abbreviations Hz (Hertz), kHz (kilohertz), MHz (megahertz), and GHz (Gigahertz).

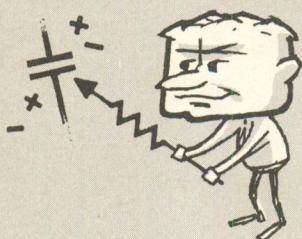
# SAFETY & FIRST AID

Because personnel working with electronic equipment are exposed to the hazard of high voltage, it is imperative that all safety regulations be consistently observed, and that each individual has a clear understanding of basic First Aid methods.

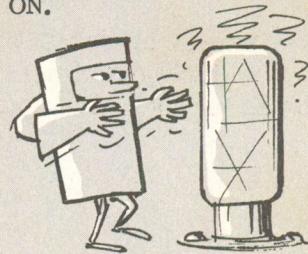
The following typical hazards must be avoided at all times:



1. Do not attempt adjustment of unprotected circuit controls, or lead dress while the power is ON.



2. Do not change heavily loaded vacuum tubes or other overheated components without due precaution to avoid burns.



3. Do not assume that no dangerous voltage is present when the power is OFF. Charged capacitors may retain dangerous voltages for long periods, and should be discharged through a suitable resistor before any circuit points are touched.

4. At all times avoid placing any parts of the body in series between ground and circuit points, whether or not power is ON.



For their own protection, and the protection of others, all electronic personnel should become thoroughly familiar with the approved First Aid treatment of burns and shock. There are three principal degrees of burns, recognizable as follows:

1. A first degree burn reddens the skin
2. A second degree burn blisters the skin
3. A third degree burn chars the flesh and frequently places the victim in a state of shock accompanied by respiratory paralysis.

Respiratory paralysis in the victim can cause death within seconds, by suffocation. For this reason it is imperative that the approved method of artificial respiration be initiated immediately and continued until the victim's breathing is normal.

A muscular spasm or unconsciousness may render the victim unable to free himself of the electric power. If this is the case, turn the power OFF immediately.

## WARNING

**DO NOT TOUCH HIM, OR YOU MAY SHARE HIS PREDICAMENT.**

If the power cannot be turned OFF immediately, very carefully loop a dry rope, article of clothing, length of strong cloth, or a rolled-up newspaper around the victim and pull him free of the power. Carefully avoid touching him or his clothing.

The moment he is clear of the power, place him in a reclining position, cover him with a blanket (or newspapers) to keep him warm, and begin artificial respiration. At the first opportunity, enlist help in the summoning of a doctor. If a doctor cannot be summoned, transport the victim to the doctor, infirmary, or hospital. Be sure that the victim is kept well covered and warm while awaiting professional aid and treatment.

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## INTRODUCTION

The FR-1800L Recorder/Reproducer operation and maintenance manuals have been prepared primarily for the service technician who requires both general and detailed theory information relating to the system.

The operation and maintenance procedures have been divided into two separate manuals: one manual covers the tape transport and system control bay, while the other provides a detailed theory of the electronics used in the FR-1800L system.

The first manual, FR-1800L Recorder/Reproducer, is limited to the description, operation and maintenance of the tape transport and the system control bay. Also included in the manual is the approved conversion, from cycles (in seconds) to hertz, which has been adopted by companies throughout the electronics industry. Following is a basic cycles to hertz conversion table:

- 1 cycle becomes 1 hertz (Hz)
- 1 kilocycle (kc) becomes 1 kilohertz (kHz)
- 1 megacycle (mc) becomes 1 megahertz (MHz)

The second manual, ES-100 Signal Electronics, contains the operation and maintenance procedures for the ES-100 electronics utilized in the FR-1800L Recorder/Reproducer.

# **CHAPTER 1**

## **GENERAL INFORMATION**

## SECTION I

### EQUIPMENT IDENTIFICATION

#### 1.1-1 GENERAL

The FR-1800L Recorder/Reproducer is a laboratory quality, general purpose, instrumentation tape system. It is capable of processing analog data within the frequency spectrum of 300 Hz to 300 kHz at tape speeds of 1-7/8 through 60 ips (inches per second). The data can be recorded on one to seven channels on one-half inch wide magnetic tape or on one to fourteen channels on one inch tape. Conversion kits are available for either tape width. The major elements of the recorder, as shown in Figure 1.1-1, are a tape transport, a system control bay, and signal electronics.

#### 1.1-2 TAPE TRANSPORT

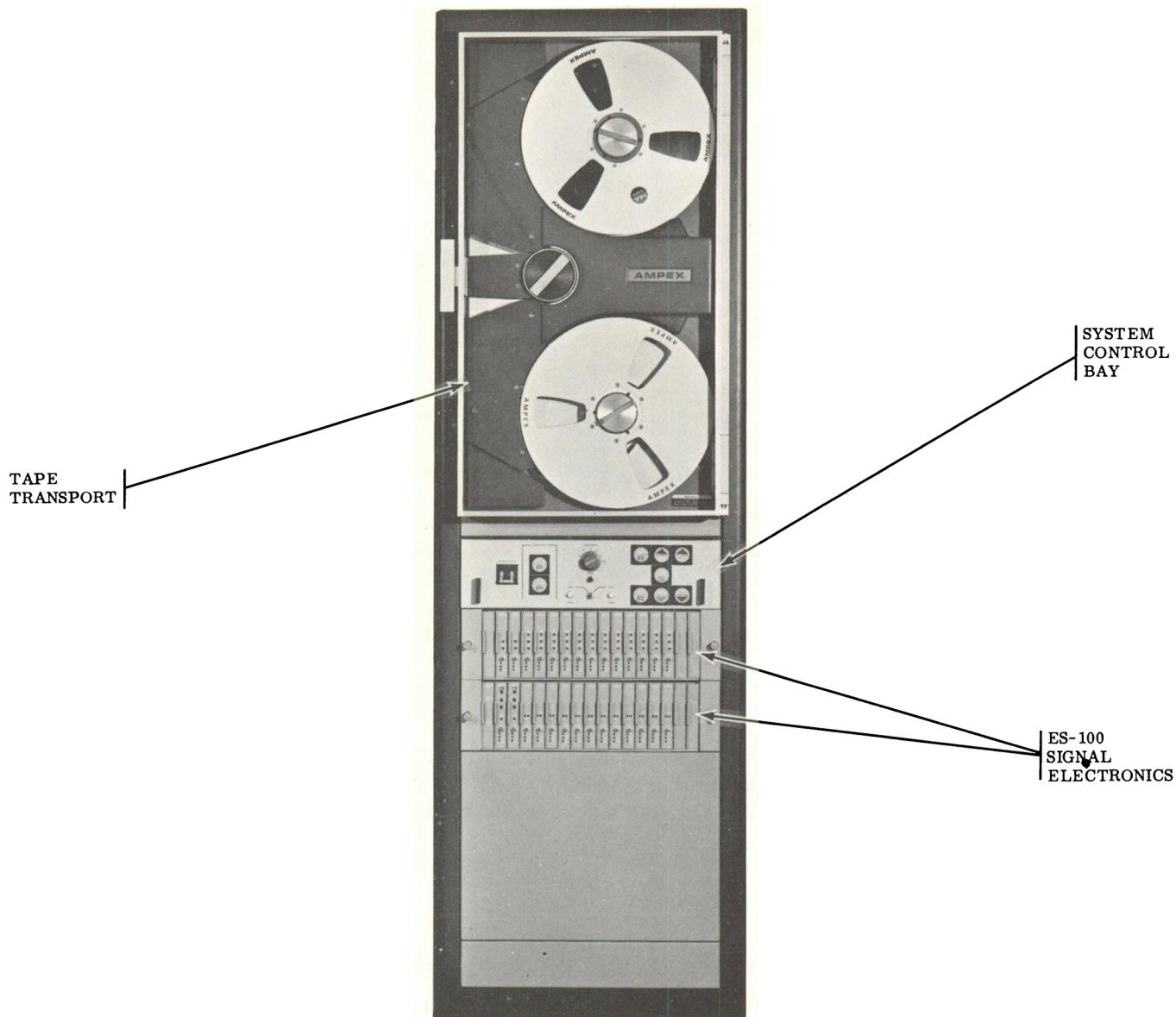
The tape transport is a device for moving magnetic tape past the record and reproduce heads at a constant, controlled speed. There are seven selectable speeds available on the transport: 1-7/8, 3-3/4, 7-1/2, 15, 30, 60, and 120 ips. However, at the 120 ips tape speed no frequency response equalization is available in the reproduce playback mode of operation.

#### 1.1-3 SYSTEM CONTROL BAY

The system control bay contains the operating controls, indicators (lamps), and related circuitry used to apply system power and establish the speed and operating modes of the tape transport. It also contains the primary power source (+24 vdc power supply) for the system lamps, control circuits, and relays.

#### 1.1-4 SIGNAL ELECTRONICS

The FR-1800L Recorder/Reproducer is equipped with the Ampex ES-100 Signal Electronics System, which comprises solid state, plug-in type amplifier modules. Signal electronics are available for three types of signal processing: direct, f-m (frequency modulation), and pdm (pulse duration modulation). For a detailed description of the signal electronics, refer to the ES-100 Signal Electronics Operation and Maintenance Manual (number 69650).



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Figure 1.1-1. FR-1800L Recorder/Reproducer

## SECTION II

### SPECIFICATIONS

#### NOTE

Because of possible design improvements or equipment modifications, all specifications listed in this section are subject to change without notification.

Table 1.2-1. Specifications - FR-1800L Recorder/Reproducer

DESCRIPTION	CHARACTERISTICS
Physical	Height with dolly: 81.31 in.
	Height without dolly: 77.31 in.
	Depth: (with rear door and transport base plate closed) 27.38 in. (with rear door and cover door opened) 63.50 in.
	Width: 23.00 in.
	Temperature: Operating: +5°C to +43°C Nonoperating: -20°C to +55°C
Environmental	Relative Humidity: 10 to 90% Noncondensing

Table 1.2-1. Specifications - FR-1800L Recorder/Reproducer (Continued)

DESCRIPTION	CHARACTERISTICS
Environmental (continued)	<p>Altitude:</p> <p>Operating: to 10,000 feet Nonoperating: to 50,000 feet</p>
	<p>Salt Atmosphere:</p> <p>As encountered in coastal regions, sea locations, and during ocean transportation.</p>
	<p>Sand and Dust Protection:</p> <p>Provided by positive cabinet air pressures, dust filters and door seals.</p>
Line Power	<p>Voltage:</p> <p>105 to 125 vac without use of external transformer or voltage regulator.</p> <p>210 to 240 vac utilizing tapped line transformer regulator.</p>
	<p>Frequency:</p> <p>47 to 63 Hz, single phase</p>
	<p>Frequency Change Rate:</p> <p>±2.5% per second</p>
	<p>Power Consumption:</p> <p>Not more than 1500 watts for a 7 channel system and shall be less than 2000 watts for a 14 channel system, exclusive of monitor scope bays and accessories.</p>
Transport	<p>Tape Speeds:</p> <p>120, 60, 30, 15, 7-1/2, 3-3/4, and 1-7/8 ips</p>
	<p>Tape Speed Accuracy: ±0.2%</p>
	<p>Tape Widths:</p> <p>1/2 in. or 1 in.</p>

Table 1.2-1. Specifications - FR-1800L Recorder/Reproducer (Continued)

DESCRIPTION	CHARACTERISTIC																																		
Transport (continued)	Tape Thickness: 1.0 and 1.5 mil base polyester																																		
	Reel Size: Up to 14 in. Ampex precision reels (NAB Hubs)																																		
	Start Time: 6 seconds maximum to reach stable speed of 60 ips																																		
	Stop Time: 4 seconds maximum at 120 ips																																		
	Fast Wind Time: Fast forward and fast reverse for 14 in. reel with 7200 feet of tape is less than 5 minutes (at ac line voltage of 117v).																																		
	Flutter: Peak-to-peak instantaneous speed variation																																		
<table> <thead> <tr> <th>Speed (ips)</th> <th><u>Bandpass</u></th> <th>% Peak-to- Peak Flutter</th> <th><u>Tape Servo</u></th> </tr> </thead> <tbody> <tr> <td>120</td> <td>0.2 Hz to 10 kHz</td> <td>0.20</td> <td></td> </tr> <tr> <td>60</td> <td>0.2 Hz to 10 kHz</td> <td>0.25</td> <td></td> </tr> <tr> <td>30</td> <td>0.2 Hz to 5 kHz</td> <td>0.35</td> <td></td> </tr> <tr> <td>15</td> <td>0.2 Hz to 2.5 kHz</td> <td>0.40</td> <td></td> </tr> <tr> <td>7-1/2</td> <td>0.2 Hz to 1.25 kHz</td> <td>0.45</td> <td></td> </tr> <tr> <td>3-3/4</td> <td>0.2 Hz to 625 Hz</td> <td>0.60</td> <td></td> </tr> <tr> <td>1-7/8</td> <td>0.2 Hz to 312 Hz</td> <td>0.80</td> <td></td> </tr> </tbody> </table>				Speed (ips)	<u>Bandpass</u>	% Peak-to- Peak Flutter	<u>Tape Servo</u>	120	0.2 Hz to 10 kHz	0.20		60	0.2 Hz to 10 kHz	0.25		30	0.2 Hz to 5 kHz	0.35		15	0.2 Hz to 2.5 kHz	0.40		7-1/2	0.2 Hz to 1.25 kHz	0.45		3-3/4	0.2 Hz to 625 Hz	0.60		1-7/8	0.2 Hz to 312 Hz	0.80	
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7-1/2	0.2 Hz to 1.25 kHz	0.45																																	
3-3/4	0.2 Hz to 625 Hz	0.60																																	
1-7/8	0.2 Hz to 312 Hz	0.80																																	
Dynamic Skew: ±0.3 microseconds or less at 60 ips on adjacent tracks in the same head stack.																																			

Table 1.2-1. Specifications - FR-1800L Recorder/Reproducer (Continued)

DESCRIPTION	CHARACTERISTICS																
Heads	<p>Number of Tracks:</p> <p>1/2-in. tape - 7 tracks 1-in. tape - 14 tracks</p>																
	<p>Track Width:</p> <p>0.050 (<math>\pm 0.001</math>) in.</p>																
	<p>Track Spacing:</p> <p>0.070 (<math>\pm 0.002</math>) in.</p>																
	<p>Head Spacing:</p> <p>1.500 (<math>\pm 0.010</math>) in.</p>																
	<p>Head Life:</p> <p>1000 hours minimum (when specified tape is used, see paragraph 3.2-3)</p>																
	<p>Gap Azimuth:</p> <p><math>\pm 1</math> minute of arc</p>																
	<p>Gap Scatter:</p> <p>Less than .0001 in.</p>																
Capstan Servo System	<p>Standard Reference Frequency</p> <table> <thead> <tr> <th><u>Tape Speed (ips)</u></th> <th><u>Frequency</u></th> </tr> </thead> <tbody> <tr> <td>120</td> <td>200 kHz</td> </tr> <tr> <td>60</td> <td>100 kHz</td> </tr> <tr> <td>30</td> <td>50 kHz</td> </tr> <tr> <td>15</td> <td>25 kHz</td> </tr> <tr> <td>7-1/2</td> <td>12.5 kHz</td> </tr> <tr> <td>3-3/4</td> <td>6.25 kHz</td> </tr> <tr> <td>1-7/8</td> <td>3.12 kHz</td> </tr> </tbody> </table>	<u>Tape Speed (ips)</u>	<u>Frequency</u>	120	200 kHz	60	100 kHz	30	50 kHz	15	25 kHz	7-1/2	12.5 kHz	3-3/4	6.25 kHz	1-7/8	3.12 kHz
<u>Tape Speed (ips)</u>	<u>Frequency</u>																
120	200 kHz																
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15	25 kHz																
7-1/2	12.5 kHz																
3-3/4	6.25 kHz																
1-7/8	3.12 kHz																

Table 1.2-1. Specifications - FR-1800L Recorder/Reproducer (Continued)

DESCRIPTION	CHARACTERISTICS
Capstan Servo System (continued)	<p><b>Warm Up Time:</b> 15 seconds with equipment within specified operating temperature and with frequency standard stabilized.</p> <p><b>Time Base Expansion and Contraction:</b> Over entire transport speed range without modifications.</p> <p><b>Reference Track:</b> Reference signal can be recorded using direct system electronics on any data track in order to utilize tape servo on reproduction.</p> <p><b>Time Base Error:</b> The instantaneous difference in time base between the reproduced control track signal and the capstan servo reference signal will be 6 <math>\mu</math>sec peak-to-peak at 60 ips and inversely proportional at other speeds.</p>

## **CHAPTER 2**

## **INSTALLATION**

## SECTION I

### UNPACKING

The FR-1800L Recorder/Reproducer is shipped in a special container to protect it during transit. Use care when unpacking to prevent damage to the equipment. Carefully examine the equipment for any damage which may have been incurred during shipment. If it is anticipated that the recorder/reproducer will be moved at a later date, retain the shipping container(s). Each system is shipped with a packing list. Use this list to ascertain that the correct units were delivered. Following unpacking, remove the two red shipping blocks from inside the transport cabinet. The blocks secure the transport base plate to prevent the base plate from opening accidentally during unpacking or shipping. Access to the blocks is through the rear cabinet door.

## SECTION II

### SITING AND INSTALLING THE EQUIPMENT

#### 2.2-1 SITE LOCATION REQUIREMENTS

2.2-2 The FR-1800L Recorder/Reproducer can be installed in any location, provided that the temperature, humidity and general environment are within the limits of the equipment as specified in Chapter 1, Section II. The mounting surface should be firm, level and free from vibration. Avoid locating the equipment in an atmosphere containing corrosive fumes, such as that found near storage batteries. Avoid locating the equipment in areas containing strong magnetic fields as they can cause deterioration of the signals on tape, as well as magnetize the record heads and possible other components. Make sure sufficient clearance is allowed on all sides of the recorder to permit opening of front and rear doors for servicing and maintenance. Proper clearance is also important to ensure sufficient air space to permit an adequate flow of cooling air through the components and cabinet.

2.2-3 Figure 2.2-1 shows the recorders' overall dimensions, and the required clearances for swinging doors, transport extensions, etc.

#### **WARNING**

TO PREVENT INJURY TO PERSONNEL OR  
DAMAGE TO EQUIPMENT, THE CABINET  
RACK MUST BE BOLTED TO THE FLOOR  
IF A RACK DOLLY IS NOT USED.

#### 2.2-4 CABLING

System cabling is installed at the factory. Refer to drawing 1216954 in Chapter 6 for cabling connection diagrams for the various FR-1800L Recorder/Reproducer configurations.

#### 2.2-5 CONNECTION FOR SEQUENTIAL OPERATION

A sequential cable (Ampex part number 48921-15) is available if sequential operation between two recorders is desired. The cable is connected between J206 at the rear of the control bay of each recorder. Figure 2.2-2 shows the location of J206.

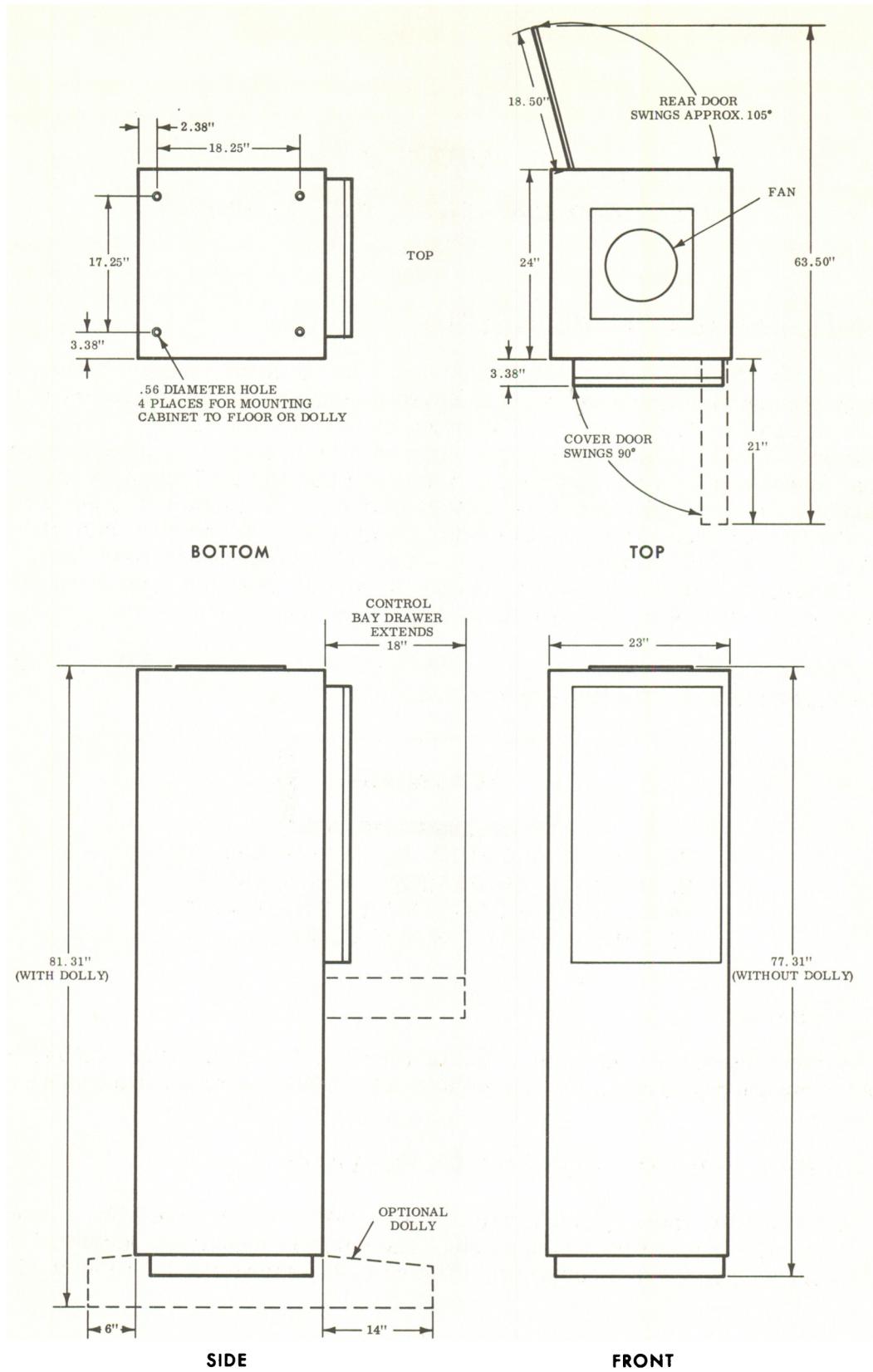


Figure 2.2-1. Overall Dimensions and Clearances

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## 2.2-6 CONNECTION FOR REMOTE CONTROL OPERATION

Operation from a remote location requires use of the Remote Control (Ampex part number 1800711). Connection for remote control operation is made at J207 on the rear of the control bay. Figure 2.2-2 shows the location of J207.

## 2.2-7 CONNECTIONS FOR CONTROL TRACK OPERATION

A control track signal may be recorded and reproduced on any channel of the system. To utilize this control track signal, connect a jumper cable between J213 on the system control bay and the appropriate channel output connector on the reproduce bay; then, connect a jumper cable between J214 (also on the control bay) and the appropriate channel input connector on the record bay. See Figure 2.2-2.

## 2.2-8 CONNECTIONS FOR EXTERNAL CAPSTAN SPEED REFERENCE

If desired, an external frequency (400 kHz) may be substituted for the normal capstan speed reference signal. For this installation, the external frequency source is connected to J212 (EXT REF.). See Figure 2.2-2.

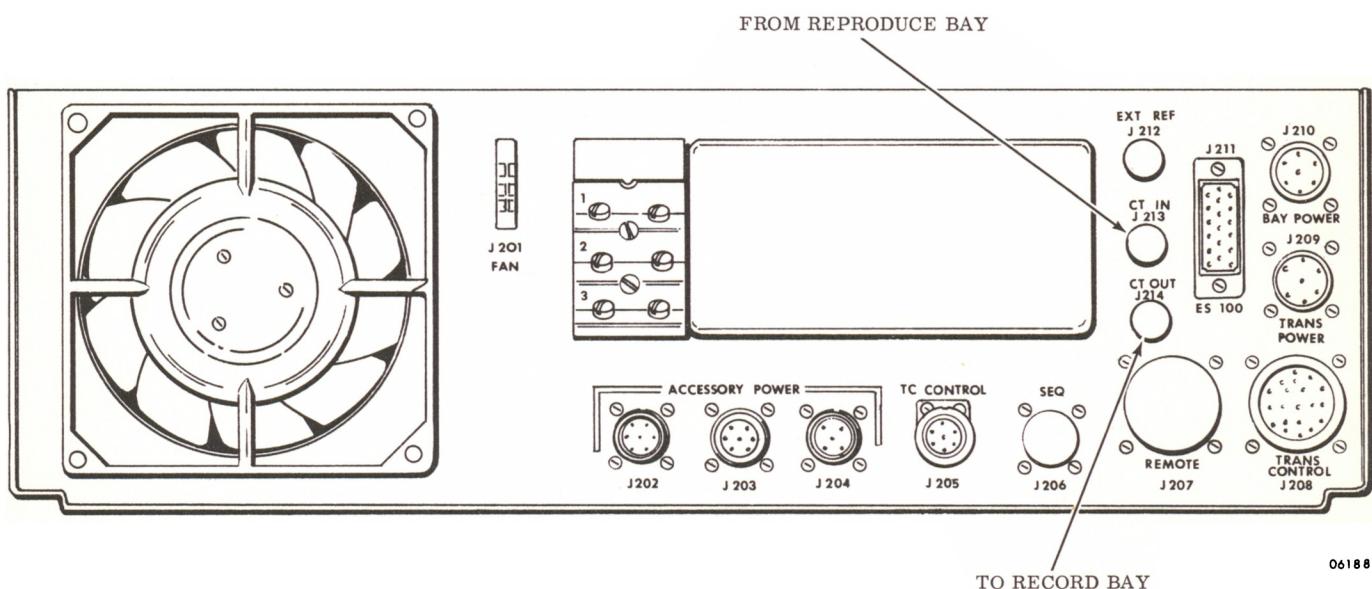


Figure 2.2-2. Rear of System Control Bay, Showing Location of Connectors

# **CHAPTER 3**

## **OPERATION**

## SECTION I

### CONTROLS AND INDICATORS

#### 3.1-1 GENERAL

The FR-1800L Recorder/Reproducer is operated from two control panels; a front panel and an inner panel. The panels are located in the system control bay directly below the tape transport.

#### 3.1-2 FRONT PANEL CONTROLS AND INDICATORS

The front panel controls and indicators, shown in Figure 3.1-1, are described in Table 3.1-1.

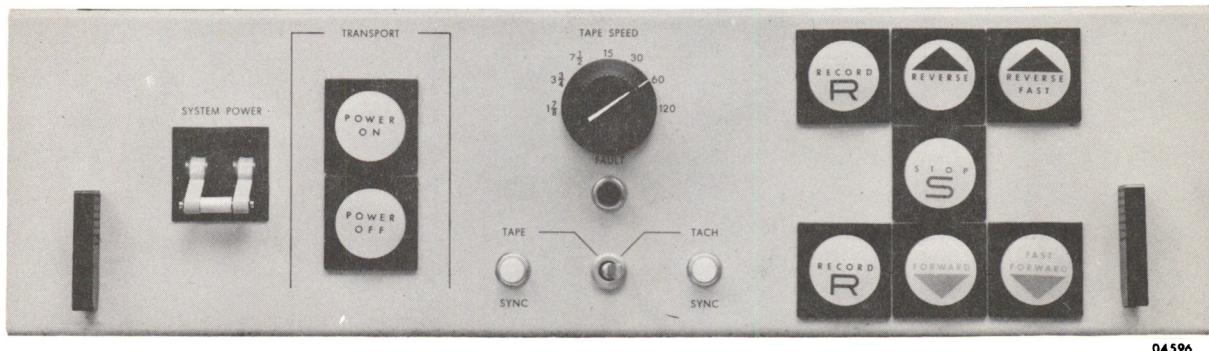


Figure 3.1-1. Front Panel Controls and Indicators

Table 3.1-1. System Control Bay, Front Panel Controls and Indicators

CONTROL OR INDICATOR	TYPE	REF.	FUNCTION
SYSTEM POWER	Circuit Breaker	CB1	Applies power to entire system.
TRANSPORT POWER ON	Pushbutton	S9	Applies power to tape transport.
TRANSPORT POWER OFF	Pushbutton	S8	Inactivates the tape transport by removing +24 vdc from the control logic circuitry in the control bay.

Table 3.1-1. System Control Bay, Front Panel Controls and Indicators (Continued)

CONTROL OR INDICATOR	TYPE	REF.	FUNCTION
RECORD (2 CONTROLS)	Pushbutton	S5 S6	Places system in the record mode. Both pushbuttons must be depressed to begin the record function after the system is in either the forward or reverse mode.
FORWARD	Pushbutton	S1	Places system in the forward mode.
FAST FORWARD	Pushbutton	S2	Places system in the fast forward mode. Heads lift from the tape and the tape begins the rapid movement in the forward direction.
REVERSE	Pushbutton	S3	Places system in the reverse mode.
FAST REVERSE	Pushbutton	S4	Places system in the fast reverse mode. Heads lift from the tape and the tape begins the rapid movement in the reverse direction.
STOP	Pushbutton	S7	Places system in the stop (standby) mode.
TAPE SPEED	7-Position Rotary Switch	S18	Permits selection of any one of seven indicated tape speeds.
TAPE SYNC-TACH SYNC	Toggle Switch	S19	TAPE SYNC selects the tape control track signal as the servo input. TACH SYNC selects the capstan tachometer signal as the servo input.
TAPE SYNC Indicator Lamp		DS11	Indicates that the capstan is synchronized at the selected tape speed and controlled by the tape control track signal.

Table 3.1-1. System Control Bay, Front Panel Controls and Indicators (Continued)

CONTROL OR INDICATOR	TYPE	REF.	FUNCTION
TACH SYNC Indicator Lamp		DS12	Indicates that the capstan is synchronized at the selected tape speed and controlled by the capstan tachometer signal.
FAULT	Red Indicator Lamp	DS10	Indicates that end-of-tape has been reached or that a broken tape condition exists. Also, illuminates when TEST-OPER switch on the inner control panel is in the TEST position.

### 3.1-3 INNER PANEL CONTROLS AND INDICATORS

The inner panel is mounted horizontally inside the control bay. The controls and indicators, shown in Figure 3.1-2, are described in Table 3.1-2.



Figure 3.1-2. Inner Panel Controls and Indicators

Table 3.1-2. System Control Bay, Inner Panel Controls and Indicators

CONTROL OR INDICATOR	TYPE	REF.	FUNCTION
HEAD USAGE	Meter	M2	Indicates cumulative hours of head operation.
RUNNING TIME	Meter	M1	Indicates cumulative transport operating time.
BIAS DISABLE	Pushbutton (momentary)	S14	Depression of the switch removes bias from record head drivers.

Table 3.1-2. System Control Bay, Inner Panel Controls and Indicators (Continued)

CONTROL OR INDICATOR	TYPE	REF.	FUNCTION
SPEED BUS	Toggle Switch	S15	Selects either the A or B plug-in equalizer when two-speed electronics are used.
TEST-OPER	Toggle Switch	S13	Switch is normally in the OPER (operate) position. In the TEST position, the transport is disabled and the record electronics are energized. The RECORD pushbuttons and the FAULT indicator will light.
NORMAL-SEARCH	Toggle Switch	S12	Switch is in the NORMAL position during data recording and reproduction. The SEARCH position is used in the search mode to locate a specific signal on tape during fast speeds.
AUTO CYCLE	3-Position Rotary Switch	S17	Provides initiation of auto cycle operation between two points on the tape. The positions of the switch are labeled OFF, REP (reproduce) and FF (fast forward). The switch is in the OFF position when auto cycle is not desired. In the REP position, the auto cycle mode is initiated at normal tape speeds. In the FF position, the tape moves back and forth at fast speeds, however the heads are retracted from the tape.
SEQUENTIAL	Toggle Switch	S16	Provides selection of direction (FWD or REV) of sequential operation of two identical recorders. OFF disables the sequential function.
REF OSC	3-Position Toggle Switch	S11	Provides selection of any one of three reference signal sources for synchronization of the capstan servo: XTAL selects internal crystal controlled oscillator,

Table 3.1-2. System Control Bay, Inner Panel Controls and Indicators (Continued)

CONTROL OR INDICATOR	TYPE	REF.	FUNCTION
REF OSC (Continued)	3-Position Toggle Switch	S11	VFO selects internal variable frequency oscillator (operational assembly), EXT selects external reference oscillator.
+24, +12, -12, GND, REF.	Test Points	TP1 thru TP5	Test Points TP1 through TP4 measure power supply voltages while TP5 is for monitoring capstan servo reference frequency.
LOCAL-REMOTE	2-Position (rotary)	S10	The LOCAL position permits operation using cabinet mounted controls only. The REMOTE position permits operation from a remote location using an optional remote control unit. Remote operation can always be overridden by local control.

## SECTION II

### OPERATING PROCEDURES

#### 3.2-1 GENERAL

This section contains instructions for the operation of the FR-1800L Recorder/Reproducer. To ensure proper operation, the paragraphs containing the pre-operational procedures should be carefully noted.

#### 3.2-2 PRE-OPERATIONAL PROCEDURES

Prior to starting the system, the pre-operational procedures should be performed. However, it is also important at this time to determine if the recorder is within the preventive maintenance time limits as described in Chapter 5, Section I.

#### 3.2-3 TAPE SELECTION

Ampex magnetic tape, type 771, 761, or 748 is recommended for use on the FR-1800L Recorder/Reproducer.

#### 3.2-4 TAPE REEL INSTALLATION

Place a full reel of tape on the supply hub of the tape transport and an empty reel on the take-up hub. For forward operation, the FR-1800L Recorder/Reproducer system requires that the supply hub be at the top and the take-up hub be at the bottom. Tape reel loading is accomplished with system power off. The tape reels are installed by seating the reels firmly against the flange of the hub and tightening the holddown devices clockwise.

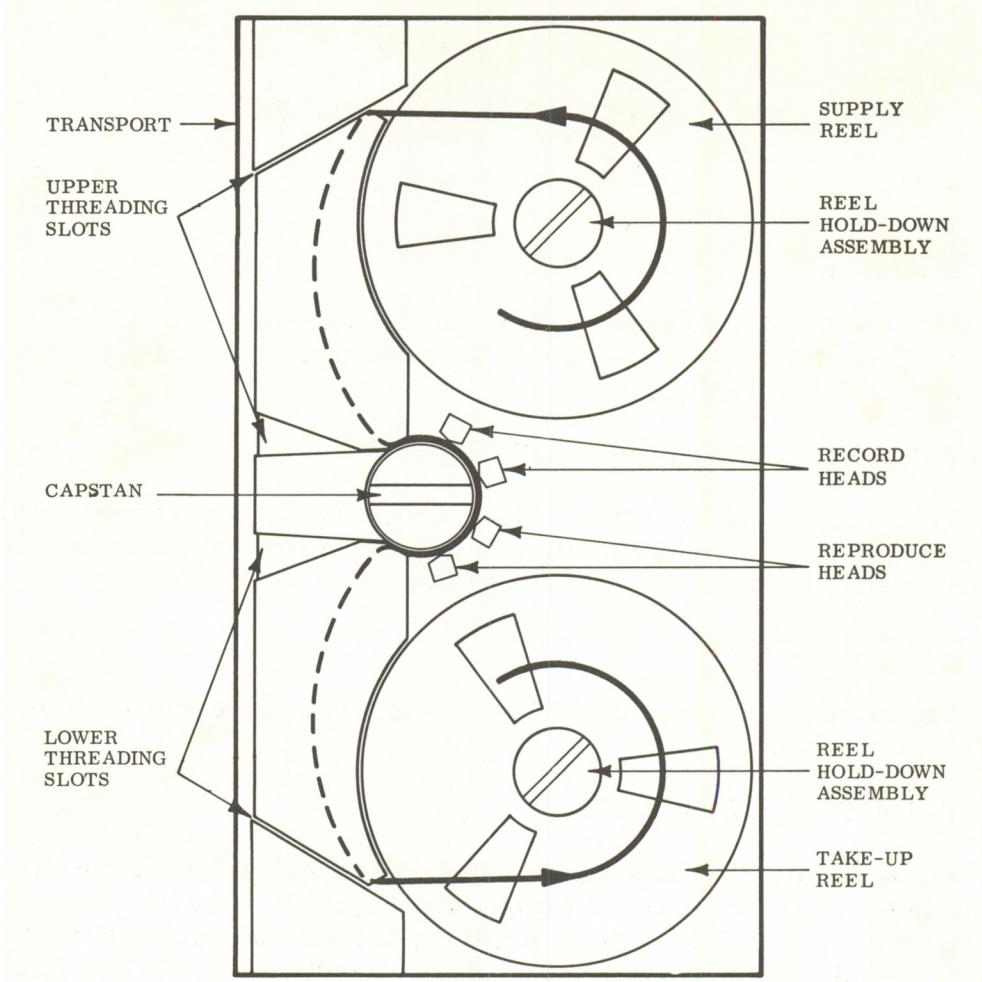
#### 3.2-5 TAPE THREADING

The tape threading path is shown in Figure 3.2-1. The procedure for tape threading is as follows:

##### NOTE

The tape must be threaded with dull side (oxide surface) facing the head stack.

- a. Pull a length of tape from the supply reel, and insert in upper threading slots.
- b. Place the tape in the gap between the capstan and the first head. Rotate the capstan and allow the tape to thread itself around the capstan.



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Figure 3.2-1. Tape Threading Path

- c. Insert the tape in the lower threading slots.
- d. Hold the end of the tape to the take-up reel hub through one of the reel slots. Wind the remaining tape on the take-up reel, pulling it tight.

### 3.2-6 OPERATING PROCEDURES

The recorder will operate in any of the following modes: record, forward, fast forward, reverse, fast reverse, search (fast forward or fast reverse), sequential and auto cycle. These modes are selected by pushbuttons, toggle switches, and rotary switches located on the system control bay front and inner panels.

**NOTE**

In locations where unusually high intensity overhead illumination exists, it may be necessary to operate the tape transport with the transport dust cover closed to prevent the light from affecting the reel servos.

**3.2-7 INITIAL SETTINGS**

Prior to turning the system on, place the inner panel controls in the following positions:

<u>Switch</u>	<u>Position</u>
LOCAL-REMOTE	LOCAL
TEST-OPER	OPER
NORMAL-SEARCH	NORMAL
AUTO CYCLE	OFF
REF OSC	XTAL
SEQUENTIAL	OFF

**3.2-8 APPLICATION OF POWER**

To apply power to the system, activate the following controls on the front panel of the control bay:

- a. SYSTEM POWER circuit breaker to ON.
- b. TRANSPORT POWER ON pushbutton depressed.

**3.2-9 TAPE SPEED SELECTION IN SIGNAL ELECTRONICS ASSEMBLIES****3.2-10 MULTISPEED ELECTRONICS**

In systems equipped for multispeed operation the changes required at the signal electronics modules are accomplished automatically when the TAPE SPEED selector switch is reset to a new position. No manual alteration or adjustment of components in the signal electronics system is necessary.

**NOTE**

When multispeed signal electronics are used, the recorder/reproducer must be stopped, in the POWER ON condition, for at least 30 seconds after the TAPE SPEED selector switch is reset for a different tape speed. This allows time for the motor driven speed switching cycle.

### 3.2-11 SINGLE-SPEED ELECTRONICS

In systems equipped for single-speed operation, the reproduce amplifier module plug-in unit for each signal channel must be changed whenever a new tape speed is selected. (In f-m systems, a change is also required at the f-m record amplifier module.) The types of changes required for individual recording/reproducing processes are indicated in the following paragraphs.

#### NOTE

In some applications of the recorder/reproducer the type (i.e., direct, f-m or pdm) of processing amplifier will not be the same for all signal channels.

**3.2-12 DIRECT RECORD/REPRODUCE SYSTEMS.** If the signal electronic system uses direct record and reproduce amplifier modules, the equalizer that is plugged into each reproduce amplifier module must be replaced with one that matches the new tape speed. Markings on the equalizers indicate the tape speed for which they are to be used. The appropriate equalizer for the new tape speed can be determined by referring to the Direct Reproduce Amplifier section of the ES-100 Signal Electronics System manual (Ampex Publication No. 69650). No changes are required on the direct record amplifiers.

**3.2-13 F-M RECORD/REPRODUCE SYSTEMS.** If the signal electronics system uses f-m record and reproduce amplifier modules, the filter (F-M Reproduce Filter Unit) that is plugged into each reproduce amplifier module must be replaced with one that matches the new tape speed. The filters are marked with the tape speed for which they are to be used. For further information refer to the F-M Reproduce Amplifier section of the ES-100 Signal Electronics System manual (Ampex Publication No. 69650). Speed selection on the f-m record amplifier modules is made with a speed selector switch located on the side of the module. The use of this switch is described in the F-M Record Amplifier section of the ES-100 Signal Electronics System manual.

**3.2-14 PDM RECORD/REPRODUCE SYSTEMS.** Where the signal electronics system uses pdm record and reproduce amplifier modules, a 4-position equalizer switch on the side of each reproduce amplifier module must be reset to match the new tape speed. Further information regarding the use of this switch can be found in the ES-100 Signal Electronics System manual (Ampex Publication No. 69650). No changes are required on the pdm record amplifier modules.

### 3.2-15 TAPE SPEED SELECTION AT THE TAPE TRANSPORT

Tape speeds are selectable by means of the TAPE SPEED selector switch on the front panel of the control bay. Following the selection of a tape speed, depress transport POWER ON pushbutton and wait 30 seconds before performing any operations. If only single speed signal electronic systems are used, no waiting is necessary.

### 3.2-16 RECORD MODE

The record mode is selected as follows:

- a. Depress the FORWARD or REVERSE pushbutton. The TACH SYNC indicator will illuminate.
- b. Simultaneously depress both RECORD pushbuttons.

### 3.2-17 REPRODUCE MODE

3.2-18 To initiate the reproduce mode, depress the FORWARD or REVERSE pushbutton. During tachometer synchronization, the TACH SYNC indicator will light.

3.2-19 The reproduction of a pre-recorded control track signal off tape is achieved by placing the TAPE SYNC-TACH SYNC switch in the TAPE SYNC position. During reproduction, the TAPE SYNC indicator will light.

### 3.2-20 FAST MODES

The fast modes are selected by depressing either the FAST FORWARD or FAST REVERSE pushbutton.

### 3.2-21 REMOTE OPERATION

Selection of the remote mode is achieved by placing the LOCAL-REMOTE switch in the REMOTE position. This permits remote control of all major transport functions except system power and tape speed.

### 3.2-22 SEARCH MODE

3.2-23 The search mode is selected by placing the NORMAL-SEARCH switch in the SEARCH position, and depressing either the FAST FORWARD or FAST REVERSE pushbutton.

### 3.2-24 SEQUENTIAL OPERATION

Before initiating the sequential mode, ensure that the recorders are connected as described in paragraph 2.2-5, then proceed as follows:

- a. Install a full reel of tape on both recorders (refer to paragraph 3.2-4).
- b. Set the TAPE SPEED SELECTOR switch, on both recorders, to the desired recording speed.
- c. Apply power to the recorders.
- d. Determine the direction of operation (forward or reverse) and place the SEQUENTIAL switch, on both recorders, in the desired position, FWD or REV.

- e. Depress the FORWARD (or REVERSE) and RECORD pushbuttons on the recorder selected to start the recording process. The recorder will record data until the tape supply reaches the transfer point (or a failure occurs), at which time the recording process will be transferred to the second recorder. The first recorder will continue recording (providing an overlap of data) until it is turned off by the end-of-reel photocell circuitry.
- f. Following completion of the data recording, place the SEQUENTIAL switch in the OFF position. If, for any reason, the recorders must be turned off before completion of the recording, place the SEQUENTIAL switch of the second recorder in the OFF position before removing power from the first recorder.

3.2-25    **AUTO CYCLE OPERATION** (For use with optional reel rotation or footage counter)

3.2-26    Auto cycle is the movement of tape, back and forth, between two preselected points on the tape, as set by the counter. The cycling limits on the counter are set as follows:

- a. Apply power to the system.
- b. Place the recorder in the fast mode and move the tape to the point where the cycling operation is to start. Set the left-hand counter to 0000.
- c. Move the tape to the position where the cycling operation is to end, and set the right-hand counter to 0000.

3.2-27    The auto cycle operation is as follows:

- a. Select the desired tape speed.
- b. Set the AUTO CYCLE switch to the REP position. The tape will automatically shuttle between the two preselected points.
- c. To stop the auto cycle operation, place the AUTO CYCLE switch in the OFF position.

3.2-28    **STOP MODE**

The stop mode is initiated by depressing the STOP pushbutton.

3.2-29    **TAPE REMOVAL**

Following the recording of data, rewind the tape on the supply reel. When the end-of-reel sensors stop the take-up reel, depress and hold the respective rewind direction pushbutton (FORWARD or REVERSE) until the tape completely unwinds from the take-up reel.

## **CHAPTER 4**

### **THEORY OF OPERATION**

## SECTION I

## SYSTEM THEORY

4.1-1 GENERAL

This section provides a brief description of the overall system theory of operation for the FR-1800L Recorder/Reproducer. Included in this section are descriptions of the tape transport, signal electronics, control circuitry, and power supplies used in the system. See Figure 4.1-1 for a functional block diagram of the system. A more detailed description of these functions is provided in subsequent sections of this chapter.

4.1-2 TAPE TRANSPORT

4.1-3 The tape transport is a device for moving magnetic recording tape past the record and reproduce heads at a constant, controlled rate of speed. Tape speed is controlled by the capstan servo system. The tape transport is capable of bidirectional operation; therefore, both the recording and reproduction of data may be performed in either the forward or reverse direction.

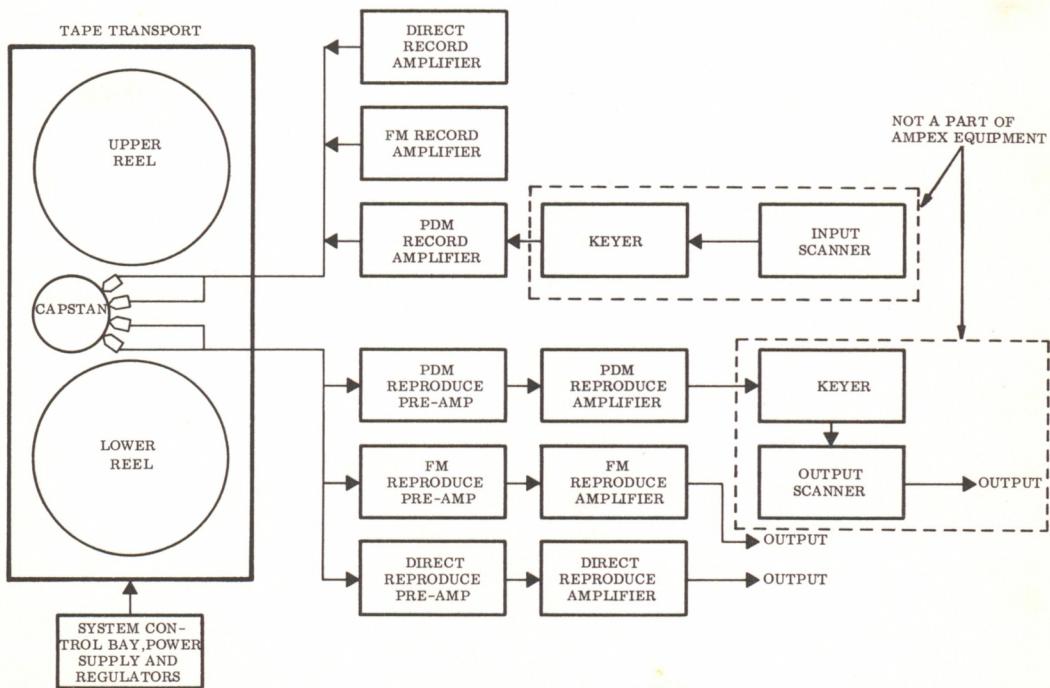


Figure 4.1-1. FR-1800L Recorder/Reproducer, Functional Diagram

4.1-4 The record and reproduce heads are assembled in stacks: two stacks for record, (one for odd channels, and one for even channels) and two stacks for reproduce (one for odd channels and one for even channels).

#### 4.1-5 SIGNAL ELECTRONICS

Three types of signal electronics are used in the FR-1800L Recorder/Reproducer: direct, f-m (frequency modulation), and pdm (pulse duration modulation). Two versions of the signal electronics are available: single-speed (with speed sensitive elements manually changed), or multi-speed (with electrically switchable elements).

#### 4.1-6 DIRECT RECORD AND REPRODUCE

In the direct method, the input signal is applied to the desired channel at the input of the record amplifier front panel or at the signal panel at the rear of the record amplifier tray. The signal is mixed with a bias frequency of 2 MHz and is then applied to the tape through the record head. The signal is recovered by the reproduce head and is routed to a preamplifier. The signal is then fed to the reproduce amplifier where it is available at the output on the front panel of the module or at the signal panel located at the rear of the reproduce tray. For a more detailed description of the direct record and reproduce amplifiers, consult the ES-100 Signal Electronics Operation and Maintenance Manual (Number 69650).

#### 4.1-7 F-M RECORD AND REPRODUCE

In the f-m method, the record and reproduce process is similar to the direct method except that the appropriate f-m components are used in order to accommodate the data being processed. For a more detailed description of the f-m record and reproduce amplifiers, consult the ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

#### 4.1-8 PDM RECORD AND REPRODUCE

In the pdm method, time-multiplexed signals are applied to the record amplifier. This process requires instantaneous sampling of a number of signal channels on a sequential basis. Through scanning, keying, and dekeying processes, the original data is reproduced at the reproduce amplifier module. For a more detailed description of the pdm record and reproduce amplifiers, consult the ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

#### 4.1-9 CONTROL CIRCUITRY

The control system is located in the system control bay located directly below the tape transport. Power distribution to the entire system is provided through the control bay. Operating modes of the tape transport are achieved through actuation of switches and push-button controls on the front panel or inner panel of the bay.

#### 4.1-10 POWER SUPPLIES

4.1-11 A primary positive and negative power supply within the system control bay provides the necessary dc voltages to the individual regulator circuit cards. The regulators (+24 vdc; -27 vdc and -12 vdc; and +10 vdc and +12 vdc) are used throughout the control bay and the tape transport to furnish the voltages to the control, relay, and lamp circuits.

4.1-12 A dual power supply for the signal electronics is located in one of the module trays to provide the positive and negative voltages for the electronics. For a more detailed description of the signal electronics power supply, consult the ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

## SECTION II

### TAPE TRANSPORT FUNCTIONS

#### 4.2-1 INTRODUCTION

This section contains a general description of the major assemblies of the FR-1800L Tape Transport. These assemblies, as shown in Figures 4.2-1 and 4.2-2, are the capstan drive system, reel drive system (including the pneumatic assembly) and head assemblies. A brief description of the assemblies is followed by more detailed discussions.

#### 4.2-2 GENERAL DESCRIPTION

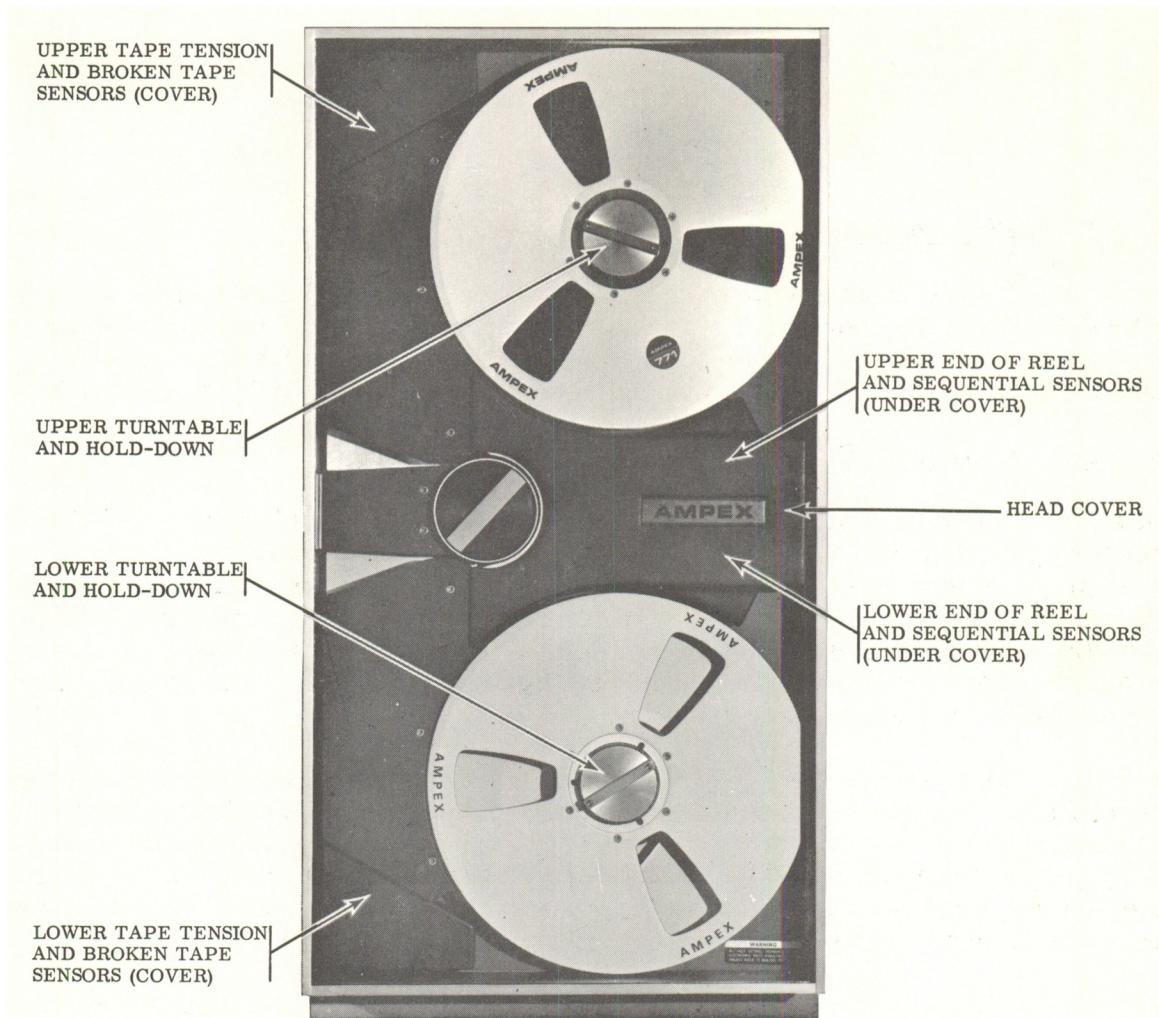
4.2-3 The flow of tape in either the forward or reverse direction, at all seven tape speeds (120, 60, 30, 15, 7-1/2, 3-3/4, 1-7/8 ips) is controlled solely by the capstan. The reel drive motors exert sufficient torque to maintain tape position in the plenum assemblies. During forward operation, the capstan rotates in a clockwise direction which results in tape flow from the upper reel to the lower reel. When rotation of the capstan is counterclockwise, the tape flow is from the lower reel to the upper reel. Tape guiding is provided by the upper and lower plenum assemblies.

4.2-4 The capstan drive system, which is servo-controlled, rotates the capstan at a constant, precise speed. During recording, the capstan servo always compares the actual capstan speed (frequency derived from the tachometer disc) with an internal reference frequency to maintain speed control. During reproduce, either the above method or a method that employs a signal from the recorded tape (tape control track) can be used to regulate the capstan speed.

4.2-5 The reel drive system automatically responds to tape motion, as commanded by the capstan, regardless of capstan speed or direction. The reel drive system is also servo-controlled and, through the associated electronics, maintains a constant tape loop in the plenums regardless of tape flow or air pressure. Air pressure is supplied by two blowers that are located adjacent to the reel motors on the interior surface of the transport baseplate. The blowers also provide cooling air to the reel and capstan motors.

#### 4.2-6 CAPSTAN DRIVE SYSTEM ASSEMBLY

The capstan drive assembly comprises a capstan drive motor, a flywheel, a tachometer assembly, and a brake assembly. An elastomer capstan is secured on the shaft of the capstan drive assembly but is not part of the overall assembly. These parts are assembled into a single unit. (See Figure 4.2-3.) Regulation of the drive motor speed, and consequently the capstan rotation rate, is accomplished by a servo (refer to paragraph 4.2-11) that compares the actual capstan rotation rate with a fixed reference.

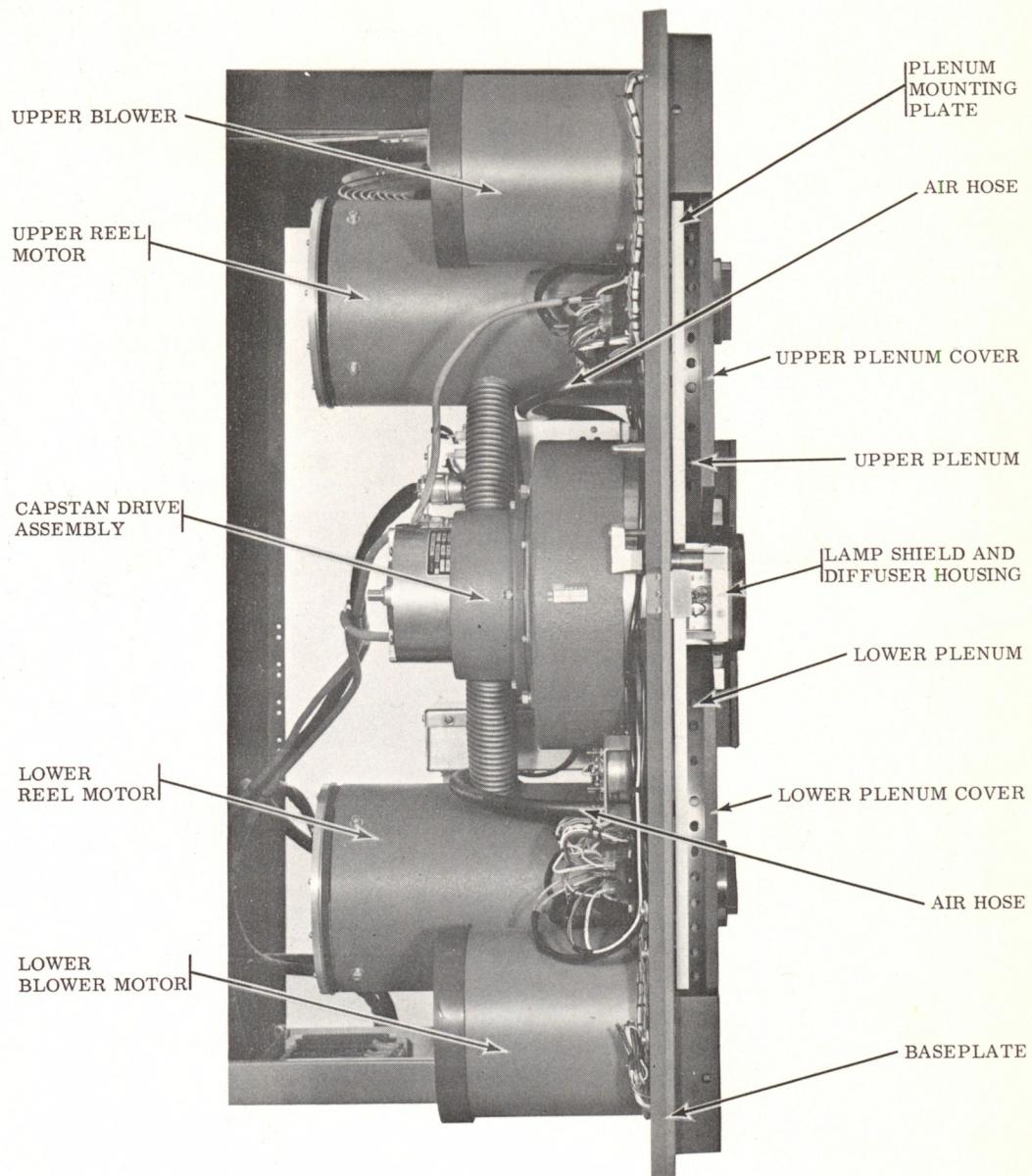


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Figure 4.2-1. Tape Transport (Front View)

#### 4.2-7 CAPSTAN DRIVE MOTOR

The capstan drive motor is an air cooled induction motor which operates off the primary power line. It is capable of bidirectional rotation and provides full power continuously during tape motion. The motor is coupled to the capstan via a flexible rubber coupling and shaft.



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Figure 4.2-2. Tape Transport (Side View)

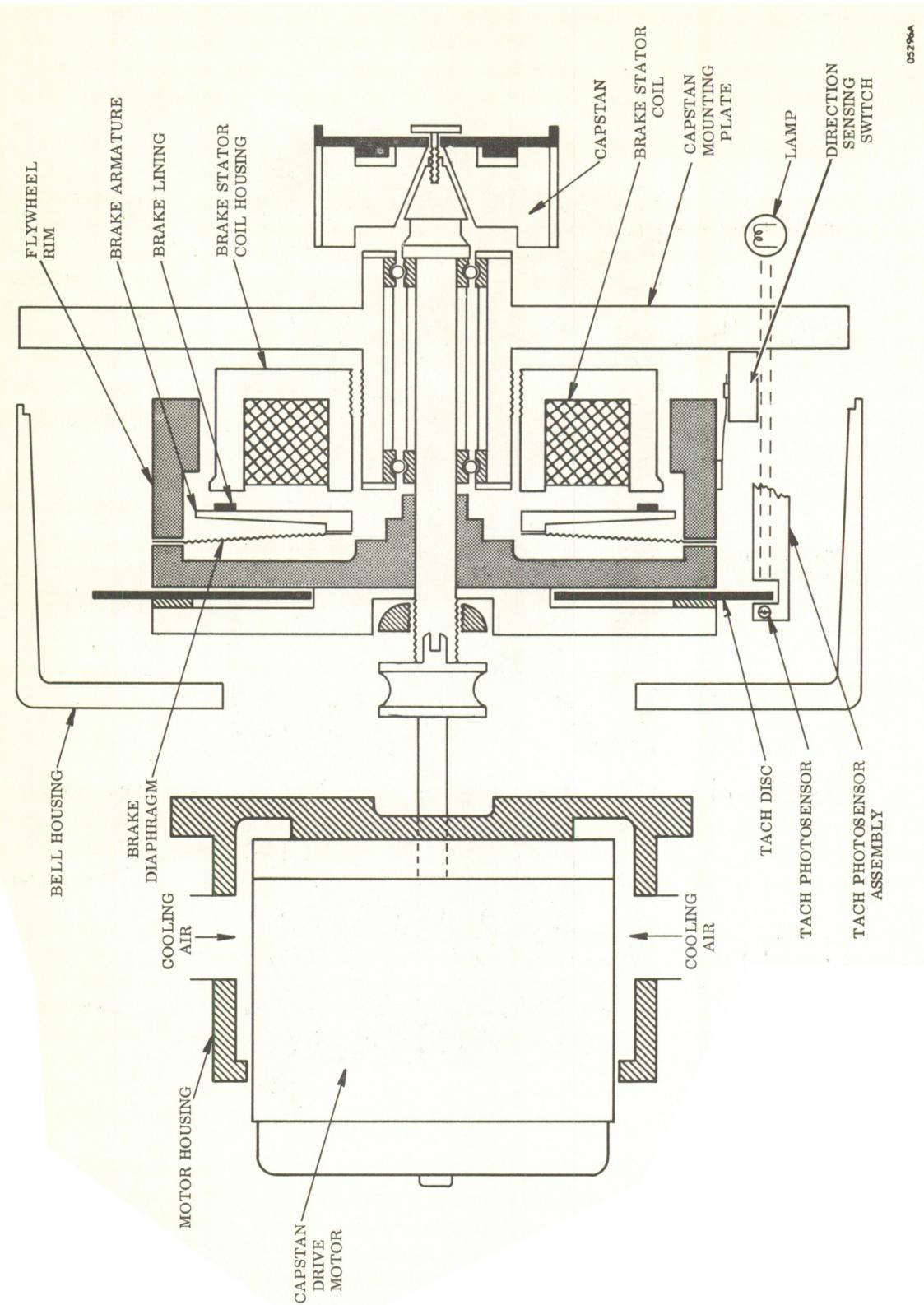


Figure 4 2-3. Capstan Drive Mechanism, Cross Section

#### 4.2-8 TACHOMETER ASSEMBLY

The tachometer assembly senses the capstan drive motor speed. It consists of a photo-etched glass disc, an exciter lamp, a photocell, photocell amplifier, and a flywheel. The outer 1/2 inch of the disc contains 10,000 equally spaced opaque lines. As the disc rotates with the drive shaft, the lines interrupt light from the exciter lamp to the photo-sensor. Rotation of the disc produces pulses which are amplified by the photocell amplifier.

#### 4.2-9 CAPSTAN BRAKE ASSEMBLY

The capstan brake assembly controls the speed of the capstan drive motor in response to speed correction signals from the capstan drive servo system. The assembly (see Figure 4.2-3) consists of a brake diaphragm, a brake armature, a brake lining, a brake stator coil, and the brake stator coil housing. When braking is applied, the brake armature, which is fixed concentrically about the center axis of the flexible brake diaphragm, is pulled toward the stator housing by the magnetic force of the brake stator coil. A carbon brake lining, permanently affixed near the outer (free-moving) edge of the armature and sliding on the stator housing, provides the braking friction. The amount of braking torque is in direct proportion to the amount of current supplied to the brake stator coil by the capstan drive servo system.

#### 4.2-10 CAPSTAN

The capstan is a precisely machined metal cylinder whose outside surface is permanently covered with a visco-elastic material. During rotation of the capstan, the outer surface provides traction which guides the tape past the heads. The elastomer surface is grooved to permit the escape of air between the tape and the capstan surface.

#### 4.2-11 CAPSTAN DRIVE SYSTEM SERVO

#### 4.2-12 FUNCTIONAL DESCRIPTION

The functional relationship between the elements of the capstan drive system servo is shown in Figure 4.2-4. The purpose of the servo circuits is to compare the signal from the tachometer assembly or a control track signal on the tape, with a fixed reference frequency to control the speed of the capstan drive motor.

**4.2-13 SERVO FEEDBACK LOOP (TACHOMETER CONTROLLED).** To maintain a constant capstan rotation rate, the servo feedback loop employs a comparison between the actual capstan speed as seen by the tachometer and the reference signal generated by the oscillator in the frequency divider. The tachometer signal frequency, which is proportional to the capstan speed, is amplified by the tachometer preamplifier and applied to the phase comparator through the frequency divider. In the phase comparator, the signal is compared with the reference frequency and the resultant output is fed to the capstan servo compensation and brake amplifier circuit. These circuits control the capstan brake current.

**4.2-14 SERVO FEEDBACK LOOP (CONTROL TRACK).** To prevent any timing errors from occurring during reproduction, a control track signal is recorded on one track of the tape. This signal supplies the feedback information which, during reproduction, is normally provided by the tachometer assembly. Since tape speed errors affect the control track frequency, the capstan motor speed is adjusted proportionately to the deviations of the control track frequency.

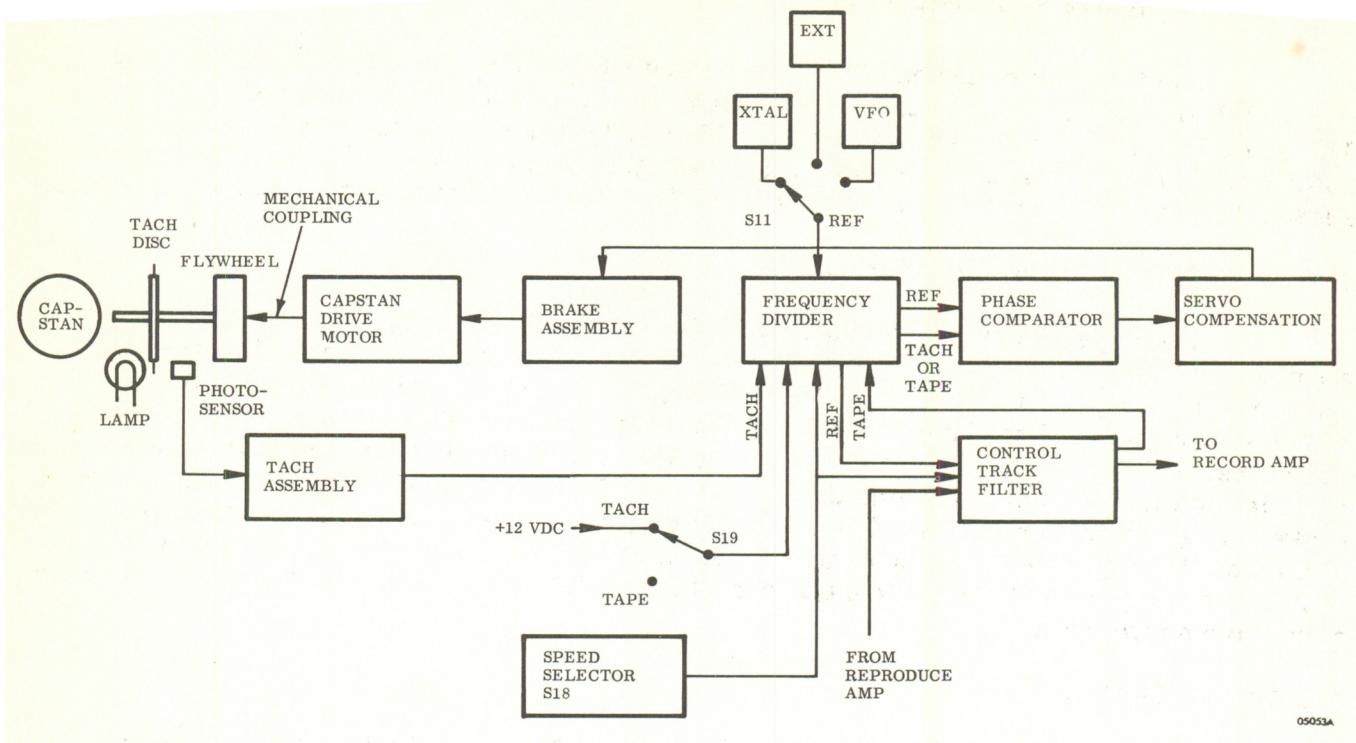


Figure 4.2-4. Capstan Drive System

**4.2-15 REFERENCE FREQUENCIES.** For each tape speed selected, an internal reference signal of a specific frequency is provided by suitable division of the reference oscillator frequency. An external reference frequency source may be used if greater frequency stability is required than that obtained from the internal reference or if a non-standard tape speed is desired. Depending upon the position of the speed selector switch, the external frequency is divided in the same manner as the internal reference.

#### 4.2-16 CIRCUIT DESCRIPTIONS

**4.2-17 TACHOMETER PREAMPLIFIER** (Schematic Number 1212902). The tachometer preamplifier assembly amplifies the output of the photocell circuit. As the tachometer disc rotates with the capstan, light from the exciter lamp strikes the photocell with varying intensities. The intensity changes are converted into signals having a frequency proportional to the speed of the capstan.

**4.2-18 CONTROL TRACK FILTERS** (Schematic Number 1212791). The control track filter improves the signal-to-noise ratio of the control track signal off tape during reproducing. During recording, the filters shape the divider output into a sinewave suitable for recording.

**4.2-19** In the record mode, as shown in Figure 4.2-5, a squarewave signal from the frequency divider is applied to an attenuation circuit and fed to the filter drive amplifier (A1) through the closed contacts of relay (K1). The output of the amplifier is coupled to seven bandpass filters (FL1 through FL7). The output of each filter, depending upon the speed

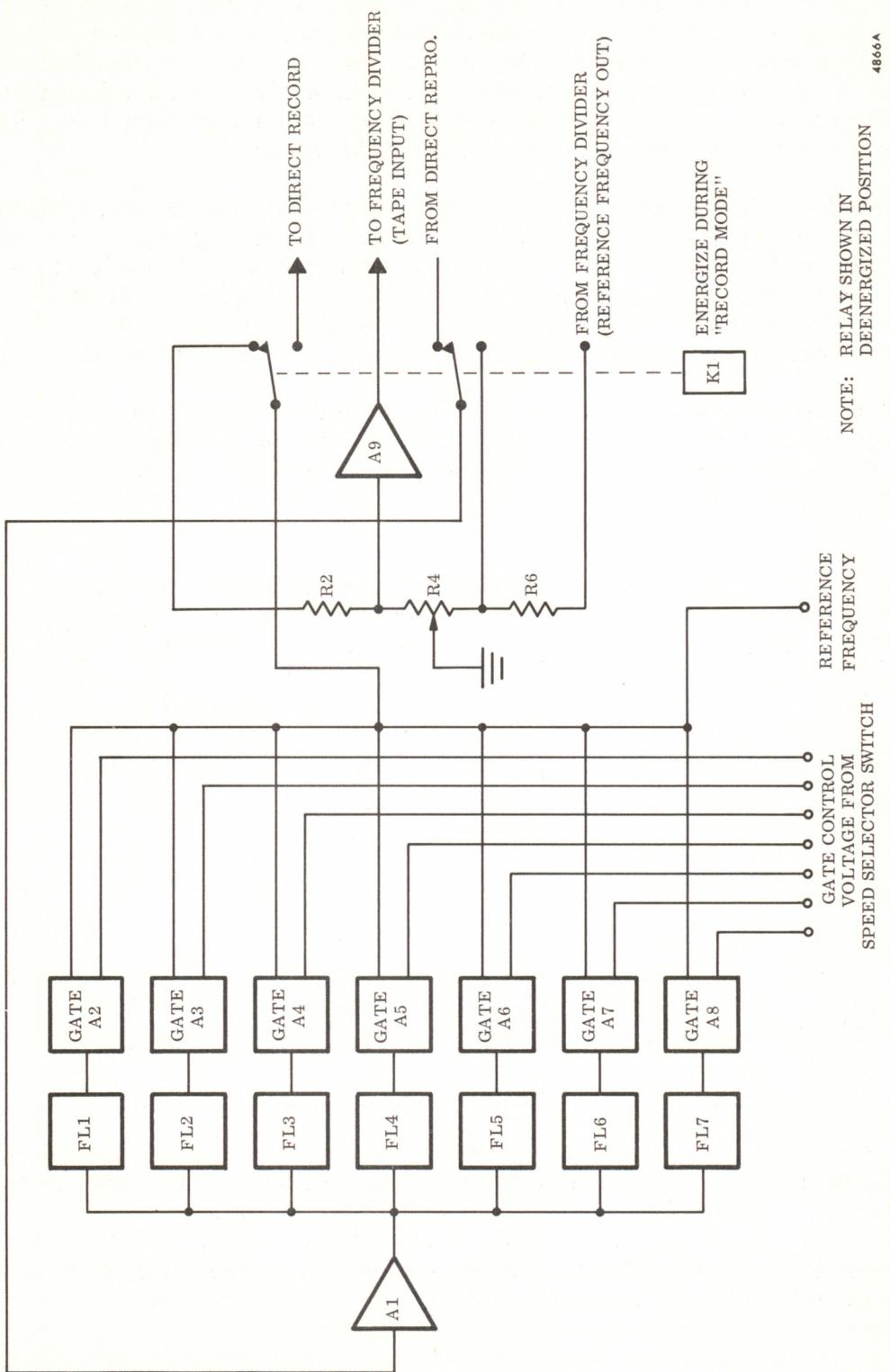


Figure 4.2-5. Control Track Filters, Block Diagram

selected, is coupled through its respective gate (A2 through A8). The gate output is fed through relay K1 contacts to the control track output connector (J214) at the rear of the control bay and then to the record amplifier.

4.2-20 In the reproduce mode, as shown in Figure 4.2-5, the signal is accepted from the control track input connector (J213) at the rear of the control bay and applied to the filter drive amplifier (A1) through the contacts of relay K1. The output of the amplifier is processed in the same manner as for the record mode except that after passing through the appropriate gate and relay K1 it is coupled to an attenuator and an operational amplifier A9. The output of the amplifier is applied to the frequency divider card.

4.2-21 FREQUENCY DIVIDER (Schematic Number 1212287). The frequency divider card (see block diagram, Figure 4.2-6) supplies standard reference frequencies to the phase comparator and to the control track (if used) record channel. It also amplifies either the capstan tachometer or control track output prior to being fed to the phase comparator. The basic frequency, before division, is 400 kHz. It can be obtained from the oscillator on the frequency divider card, an external source, or VFO (optional).

4.2-22 The 400 kHz oscillator output from A1Q2 is applied to a binary divider chain consisting of micrologic circuits A2 through A8. Each divider module supplies an output to a diode gate, and also feeds into the next lower module to provide one of the frequencies shown in column 2 of Table 4.2-1.

Table 4.2-1. Input and Output Frequencies at Frequency Divider

TAPE SPEED (ips)	OUTPUT FROM BINARY DIVIDER (kHz)	SPEED GATE	OUTPUT TO CONTROL TRACK (kHz)	DIVIDE BY A11 AND A12	OUTPUT TO PHASE COMPARATOR (kHz)
120	200	High	200	4	50
60	100	High	100	4	25
30	50	High	50	4	12.5
15	25	Low	25	2	12.5
7.5	12.5	Low	12.5	2	6.25
3.75	6.25	Low	6.25	2	3.125
1.87	3.125	Low	3.125	2	1.5625
1	2	3	4	5	6

4.2-23 When one of the three highest frequencies, corresponding to the three fastest tape speeds, is gated by voltage from the TAPE SPEED selector switch, the voltage is diode-coupled to the lower gate of assembly A13 (CR3, CR4). When one of the lower frequencies is gated by voltage from the TAPE SPEED selector switch, the voltage is diode-coupled to the upper gate of assembly A13 (CR1, CR2).

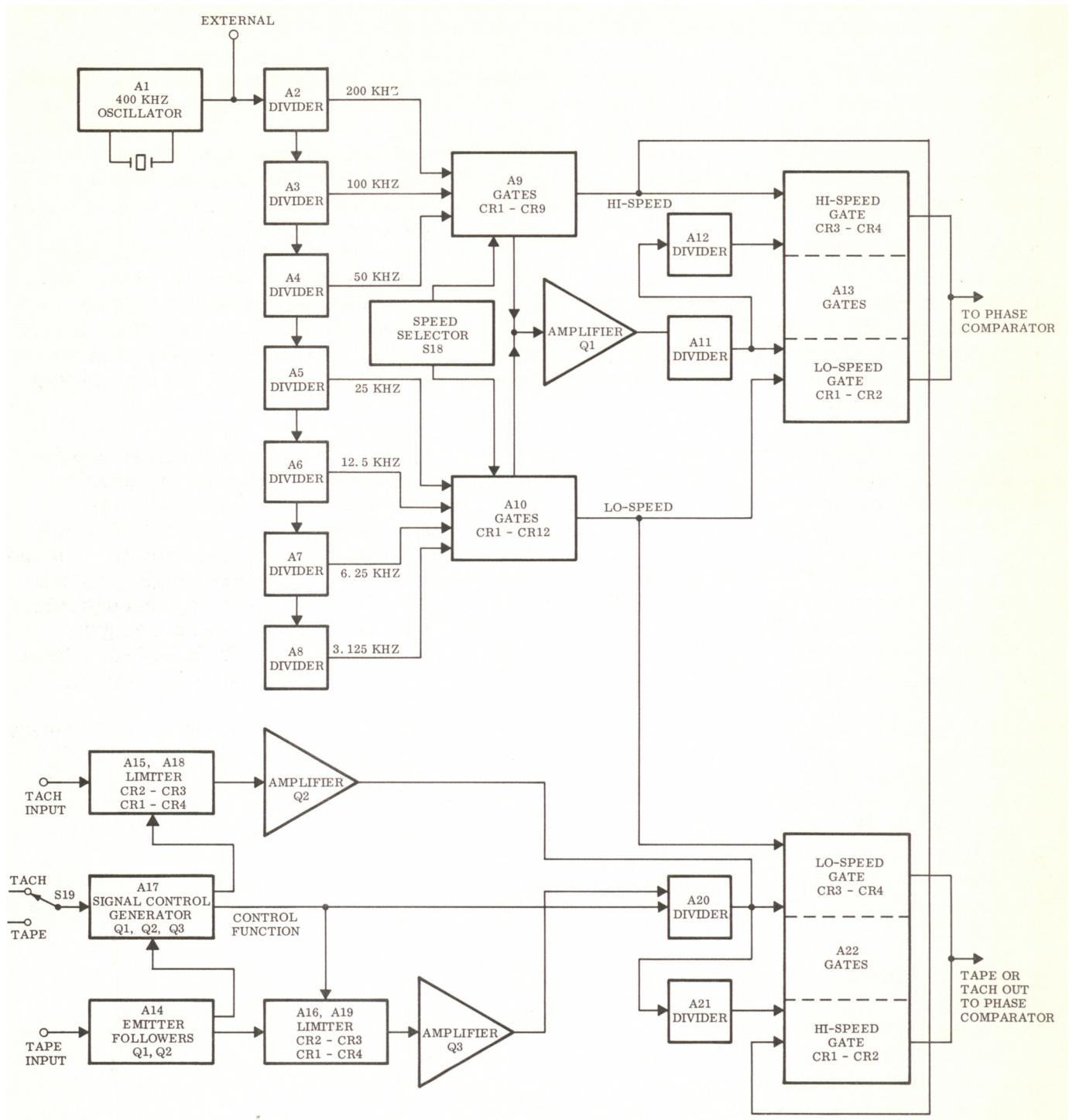


Figure 4.2-6. Frequency Divider

4.2-24 Signals from a divider, A2 through A8, are amplified and applied to terminal Y (Control Track Record) for recording on the control track (if used) without further division. These same signals are also applied to series dividers A11 and A12. The gating action of A13 as described above results in an output to the phase comparator such that the three higher frequencies are divided by four, and the four lower frequencies by two. These related frequencies are shown in columns 2, 4, and 6 of Table 4.2-1.

4.2-25 When in the tach mode, positive voltage is applied through connector contact E to the base of transistor Q1 in assembly A17. Saturation of Q1 cuts off transistor Q2 and transistor Q3 saturates, cutting off the diode gate in A16 and the output of A20, and grounding connector pin L. In the tape mode, the positive voltage is removed, and the control track signal applied from A14 is rectified by diodes CR1 and CR2 in A17. The rectified signal charges C1 and cuts off Q1 in A17. Positive bias to the base of Q2 through resistor R6 causes collector saturation, thereby applying ground to connector contact B and cutting off gate CR5-CR6 of A15. The voltage change across divider R9 and R10 cuts off Q3 in A17 so the collector (and connector contact L) change to +12 volts. Should the signal from the control disappear, Q1 will saturate, Q2 will cut off, A15 will be gated on, and control will revert to the tach mode.

4.2-26 In record or tachometer-controlled reproduce modes, a positive voltage applied at connector contact E blocks any input from control track circuits (refer to paragraph 4.2-25). The capstan tachometer signal at connector contact A enters the tach limiter circuit of A15 and amplifier A18 and passes through a diode gate (CR5, CR6, R3, R4, R5) in assembly A15 to inverter Q2. The same voltage that operated gates in assemblies A9 and A13 is extended to operate one of the two gates in assembly A22. The three higher speeds actuate the lower gate (CR1, CR2) so that the output to the phase comparator, through A21, is half the tachometer signal frequency. The lower speeds pass through the upper gate (CR3, CR4) and are not divided. The related frequencies are shown in Table 4.2-2. These may be compared with corresponding outputs of the frequency divider shown in Table 4.2-1.

4.2-27 When using the tape track for control (reproducing), the tape signal is fed through a limiter circuit of A16, amplifier A19, and a gate (CR5, CR6, R3, R4, R5) in assembly A16. In the three higher speeds, the gating voltage applied to assembly A9 is extended to the lower gate of assembly A22 so that the signal applied to the phase comparator at connector contact H is divided by four in A20 and A21. In the lower speeds, the gating voltage is applied instead to the upper gate of A22, so that the tape signal is divided by A20 only and the halved frequency is applied to the phase comparator. The related frequencies are shown in Table 4.2-2. These can be compared to the corresponding outputs of the frequency divider shown in Table 4.2-1.

4.2-28 PHASE COMPARATOR (Schematic Number 1212595). The phase comparator compares the frequency from either the tachometer or control track signal with the frequency of the reference signal and generates a correction signal of the proper magnitude and polarity to maintain the selected capstan speed. The TAPE SYNC-TACH SYNC indicator lamp circuits are also controlled through the phase comparator card. A block diagram of the phase comparator is shown in Figure 4.2-7.

Table 4.2-2. Input and Output of Mode Frequencies

TAPE SPEED (ips)	MODE	SIGNAL OFF TACH (kHz)	SIGNAL OFF TACH (kHz)	DIVIDE BY (A20/A21)	OUTPUT TO PHASE COMPARATOR (kHz)
120	TAPE TACH	200	100	4	50
				2	50
60	TAPE TACH	100	50	4	25
				2	25
30	TAPE TACH	50	25	4	12.5
				2	12.5
15	TAPE TACH	25	12.5	2	12.5
				1	12.5
7.5	TAPE TACH	12.5	6.25	2	6.25
				1	6.25
3.75	TAPE TACH	6.25	3.125	2	3.125
				1	3.125
1.875	TAPE TACH	3.125	1.5625	2	1.5625
				1	1.5625

4.2-29 There are two inputs to the phase comparator: the reference signal and the sync-off-tach (or sync-off-tape) feedback signal. The reference frequency is applied via pin Z to inverter Q1. The positive portion of the signal taken from the collector of Q1 is passed to amplifier Q9 where it is amplified, reinverted, and fed to a summing network (R29 and R25). The negative portion of the signal, taken from the collector of Q1 is differentiated by C1 and R3, and used to trigger a pulse forming circuit (Q2 and Q3). The output of the pulse forming circuit consists of negative going pulses occurring at a constant rate (frequency is dependent upon tape speed selected). These pulses are fed through flip-flop assembly A1 and a 2-stage amplifier (Q7 and Q8) to the summing network.

4.2-30 The sync-off-tach or control track off tape signal, applied via pin A through an input circuit similar to the reference signal input circuit, is fed to flip-flop assembly A2. When the capstan is not rotating, the reference signal is present but the tape or tach signal is not. As the capstan starts to rotate, the resulting tape or tach pulses are applied to flip-flop A2; however, they initially have no effect on flip-flop A1 because of the gating action of A2. When the repetition rate of the tape or tach pulses is such that two of these pulses occur between two reference signal pulses, flip-flop A2 ceases to inhibit flip-flop A1 and A1 changes state. At this instant in time the tape or tach pulses are slightly higher in frequency than the input reference signal. With A1 no longer inhibited, a slow-down command is sent to the capstan, which in turn causes the repetition rate of the tape or tach pulses to decrease. In normal operation the tape or tach pulses will lag the reference pulses by 180 degrees. This condition is the "in sync" condition. The "in sync" output is a rectangular wave, and any deviation from the "in sync" phase condition will change the shape of the waveform.

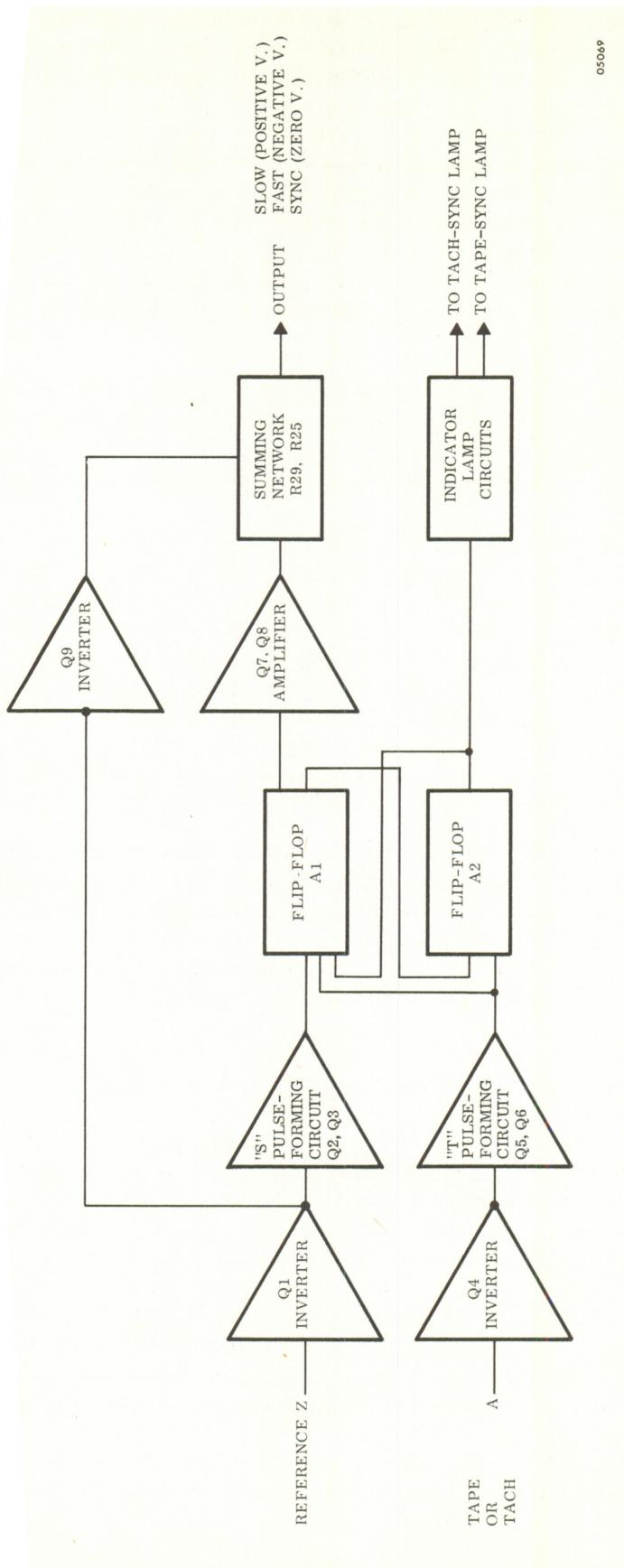


Figure 4.2-7. Phase Comparator, Block Diagram

4.2-31 In the summing network, the "in sync" waveform is added to a square wave reference pulse (from inverter Q9). The algebraic sum of the two waves is the error information (too fast, too slow, or in sync) that is passed to the capstan servo compensation and brake amplifier card.

4.2-32 The output from flip-flop A2 is also used to control the illumination of the TAPE (or TACH) SYNC lamp. During the time that tape speed is well below or above the selected speed, the output of A2 is positive and the TACH (or TAPE) SYNC lamp is inhibited. When the tape is close to correct speed, the TAPE (or TACH) SYNC lamp is on intermittently. When the tape is at correct speed the output of A2 is at zero volts and either the TAPE (or TACH) SYNC lamp will light constantly, depending on the position of the TAPE SYNC-TACH SYNC switch.

4.2-33 CAPSTAN SERVO COMPENSATION AND BRAKE AMPLIFIER (Schematic Number 1241345). The function of the capstan servo compensation and brake amplifier is to control the electromechanical brake of the capstan motor. A block diagram of the capstan servo compensation and brake amplifier circuits appears in Figure 4.2-8.

4.2-34 The output of the phase comparator, consisting of zero, positive, or negative voltages, is applied to pin A of the capstan servo compensation and brake amplifier card. High frequency, ac components are suppressed by a filter consisting of R1 through R3, C1 and C2, and operational amplifier A1. The filtered signal is then fed through contacts of relay K1 to either the tach compensation network (consisting of R7, R8, R19, C5, and C10) or the tape compensation network (R5, R6, R17, R18, and C4 and C9). These networks, in conjunction with amplifier A2 provide compensation for either the TACH or TAPE mode of operation. The type of speed compensation provided depends on the status of relay K2. For high speed operation, K2 is energized via a ground path through transistor Q2 which is forward biased by the high speed input at pin N of the card. During low speed operation, Q2 is biased off and relay K2 is deenergized.

4.2-35 Amplifier A2 has a negative feedback path through integrating capacitors C6 and C7 and resistors R13 and R14. The capacitors suppress any low frequency input error signals. Network CR3 and CR4, and R9 through R12 is an overshoot circuit which limits the positive and negative excursions on integrating capacitors C6 and C7. The output of the compensation network is amplified by A3, the gain of which is set by the voltage level at the junction of A4R1 and A4R2. The overall system gain is adjusted by R21. The difference between the input voltage on the wiper of R21 and a feedback voltage from the brake control amplifier located on heat sink (junction of A4R9 and A4R10) is sensed by differential amplifier A5Q3 and A5Q4.

4.2-36 The output of the differential amplifier is applied through brake drive amplifier Q3 to brake control amplifier Q5 and Q6 on the heat sink assembly (see schematic diagram 1241574). Transistors Q5 and Q6 function as a variable resistance in series with the brake coil. Depending on the input to the base of Q5, the emitter-to-collector resistance of Q6 either increases or decreases to provide a corresponding decrease or increase in brake coil current. A feedback voltage, analogous to the instantaneous brake coil current and brake armature position is developed across resistor R5 in the emitter circuit of Q6. This voltage, fed back to the junction of A4R9 and A4R10 on the capstan servo compensation and brake amplifier card, is applied to differential amplifier A5Q3 and A5Q4.

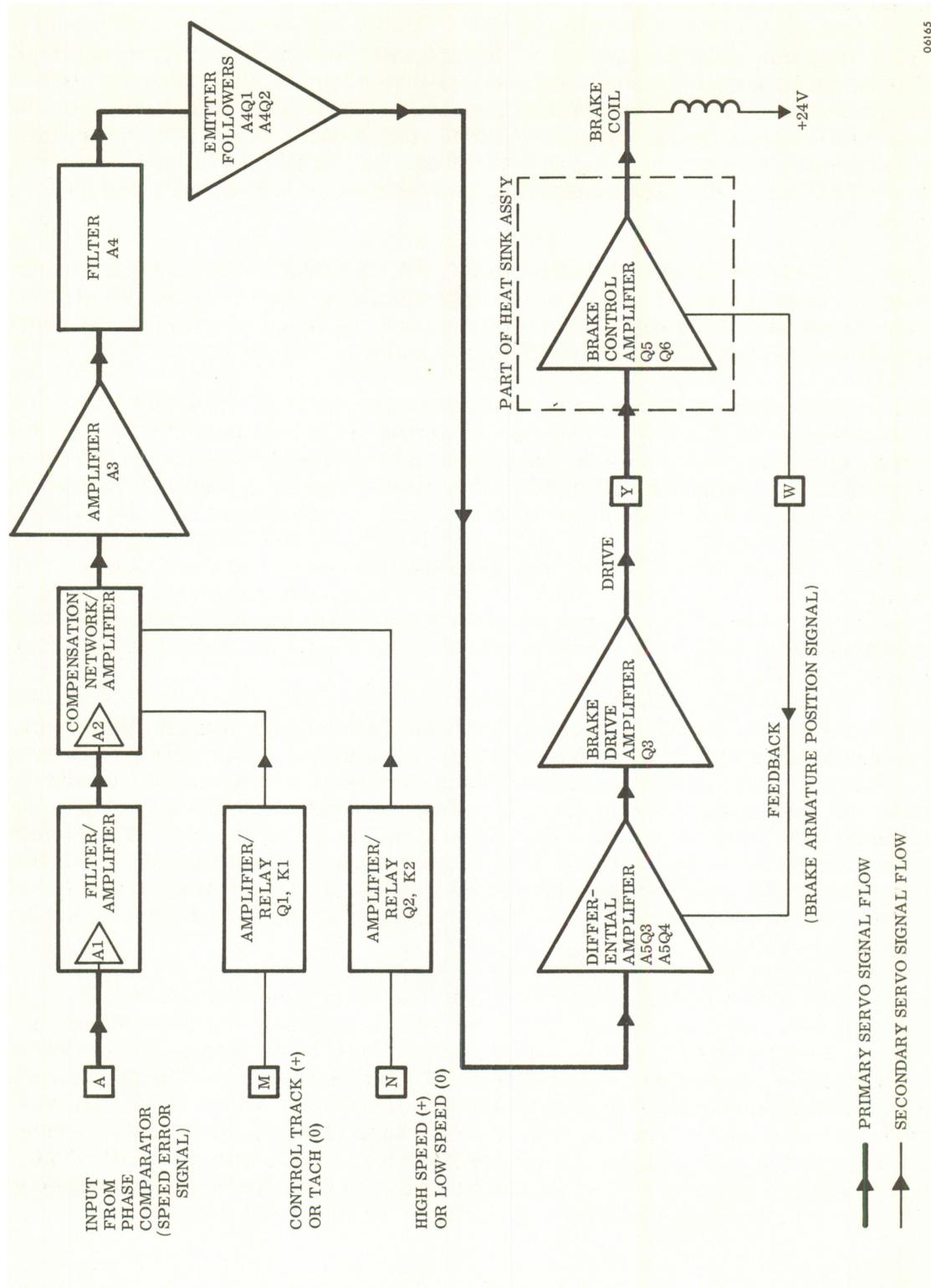


Figure 4.2-8. Capstan Servo Compensation and Brake Amplifier Block Diagram

#### 4.2-37 REEL DRIVE SYSTEM

4.2-38 The functional relationship between the elements of the reel drive system are shown in Figure 4.2-9. The reel drive system is "slaved" to the capstan drive system by a sensing arrangement that incorporates two plenums and associated photoelectric sensing circuits. Ports in the air manifold of each plenum connect to a blower motor. Because the capstan is pulling tape from one reel and pushing it toward the other, the tape loop in the plenum on the take-up reel side at the capstan will tend to be larger than the tape loop in the plenum on the supply reel side of the capstan. This tendency, sensed by the photoelectric sensing circuits, provides feedback that causes the reel drive motors to accelerate or decelerate individually as necessary to maintain a constant position of the tape.

4.2-39 For example, as the capstan rotates clockwise, tape is pulled from the upper tape reel and pushed toward the lower tape reel. This tends to shorten the tape loop in the upper plenum and lengthen the tape loop in the lower plenum. However, as the dimensions of the two tape loops start to change, the amount of light (from the light diffuser assembly) passing around the tape and reaching the upper photosensor is increased. The photosensor reacts by supplying a signal to the upper reel servo that causes the upper reel drive motor to accelerate to a speed that meets the tape demands of the capstan. Simultaneously, the amount of light passing around the tape and reaching the lower photosensor is reduced because of the larger tape loop in the light path. The lower photosensor therefore, supplies a signal to the lower reel servo that causes the lower reel drive motor to accelerate to a takeup speed compatible with the rate of tape movement.

#### 4.2-40 REEL DRIVE MOTOR ASSEMBLIES

The mechanical and electromechanical parts that form each reel drive motor assembly are shown in Figure 4.2-10.

4.2-41 REEL DRIVE MOTOR AND DISC BRAKE. The reel drive motor is a bidirectional, split-phase induction motor. Regulation of the motor speed is accomplished by a disc brake which is connected to the rear of the motor. The brake (see Figure 4.2-11) consists of a brake lining, a brake stator coil and housing, a brake armature, and a cover plate. The armature is connected to the cover plate which rotates with the motor shaft. When braking is applied, the armature is drawn into contact with the brake lining by the magnetic force of the coil. The friction provided by these contacting surfaces produces a braking force. The braking force, and thus the speed of the reel motor, is controlled by the amount of current through the coil. Cooling air for the motor and brake is supplied by the blower assembly.

4.2-42 REEL EMERGENCY BRAKE. The reel emergency brake (Figure 4.2-12) is a protective device to stop reel motion in case of power failure. It consists of a brake pulley, a brake cord, a solenoid, a center-pivoted bell crank, and a tension spring. The brake cord is wrapped around the pulley which is fixed to the reel motor shaft. One end of the cord is attached to one end of the bell crank. During normal operation, the solenoid is energized and the solenoid crank is positioned so that tension on the brake cord is released. When, because of power interruption, the solenoid becomes deenergized, the solenoid crank pulls on the brake cord, which then drags on the brake pulley. The amount of drag exerted on the pulley is a function of the tension spring, and the direction of rotation of the pulley.

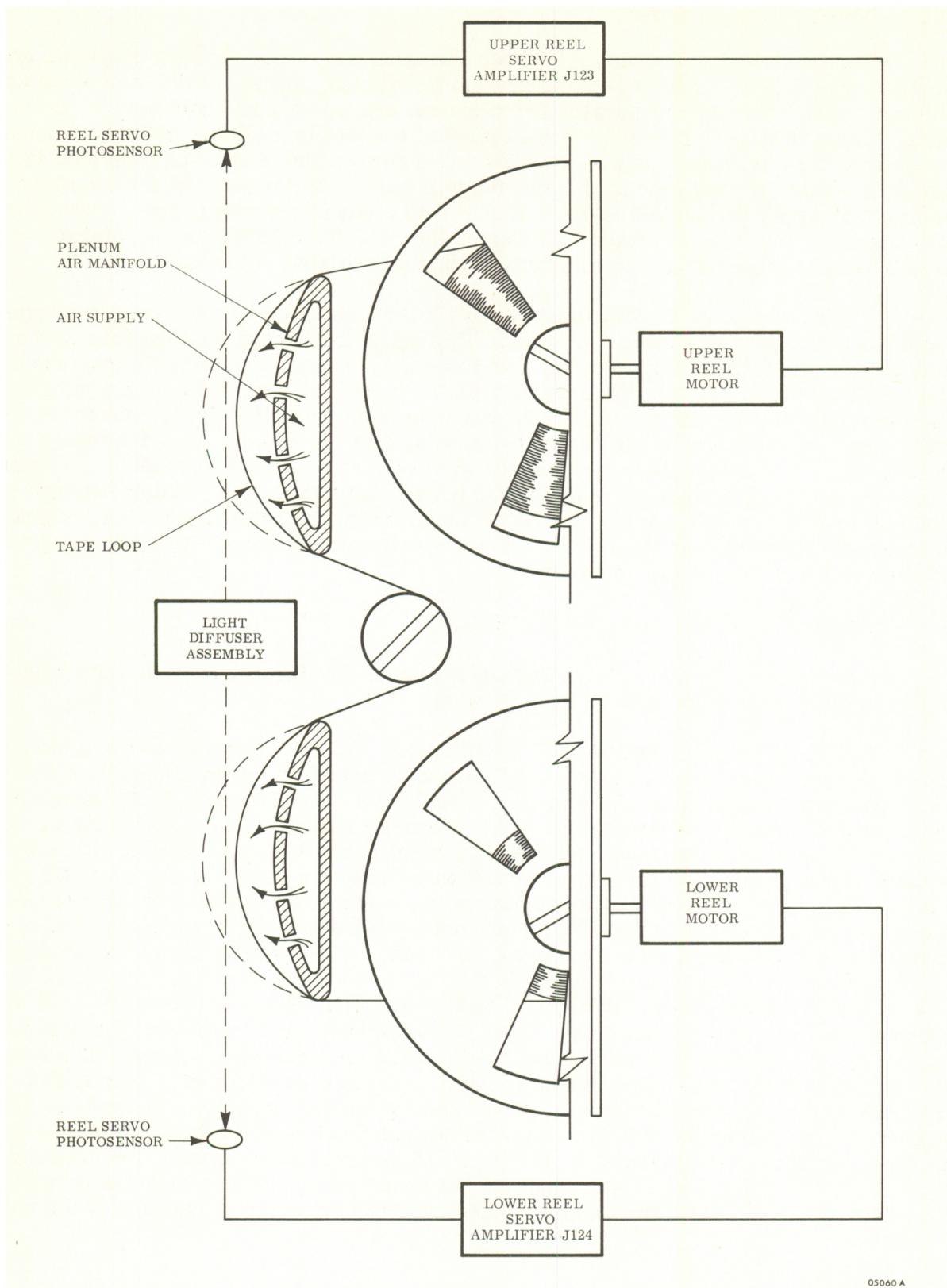


Figure 4.2-9. Reel Drive System, Functional Block Diagram

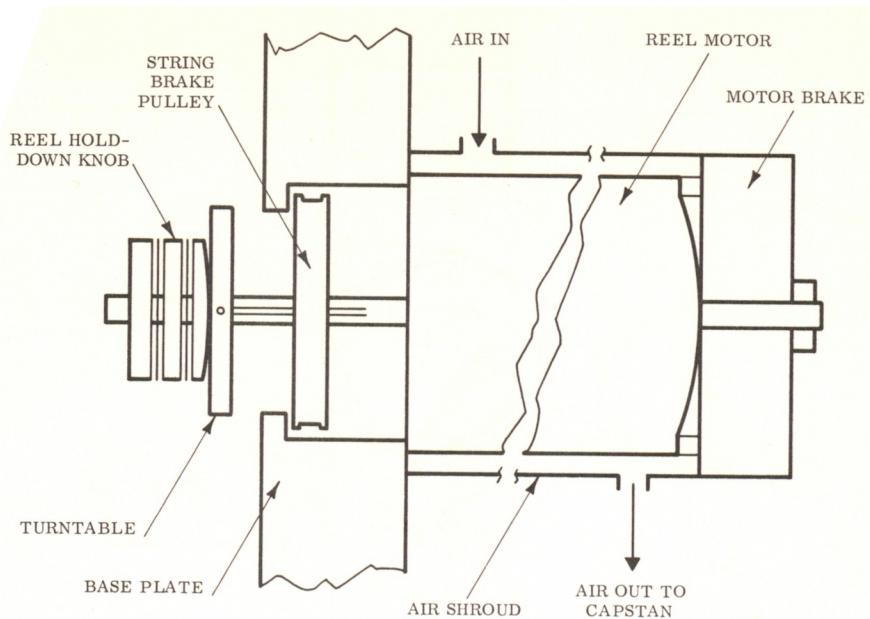


Figure 4.2-10. Reel Drive Assembly, Cross Section

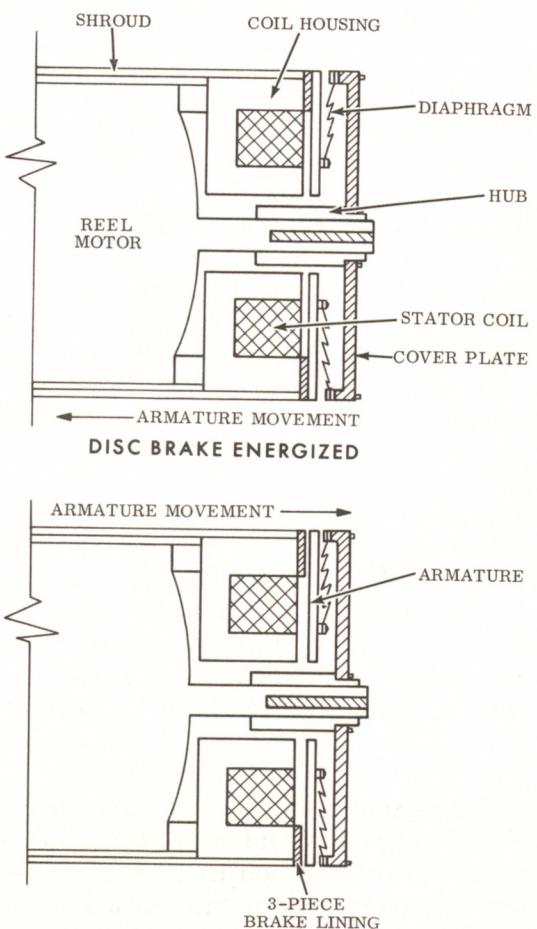
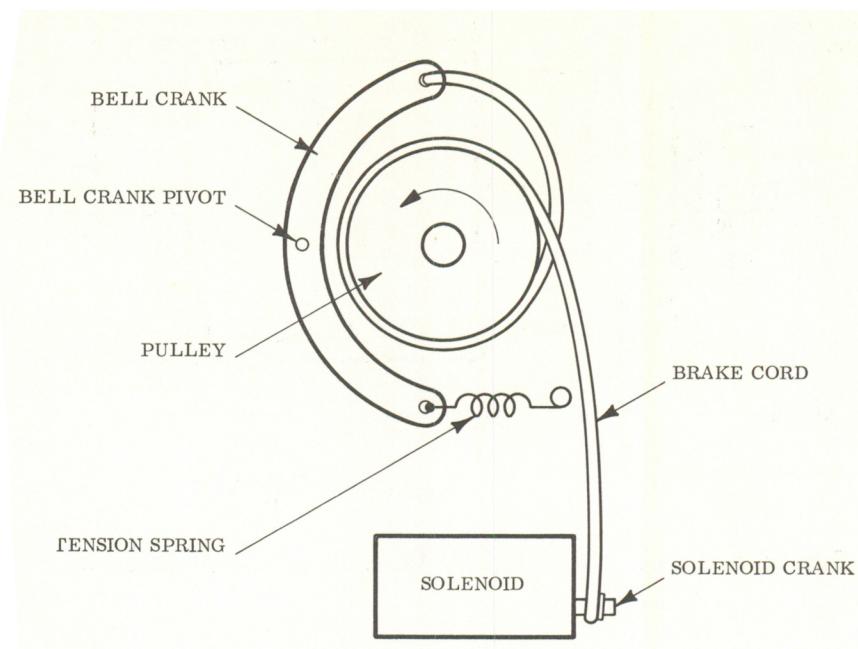


Figure 4.2-11. Disc Brake, Cross Section



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Figure 4.2-12. Reel Emergency Brake (Typical)

#### 4.2-43 REEL SERVO CARDS (Schematic Number 1240454)

4.2-44 The reel servo system employs two identical reel servo circuit cards, one for the upper reel servo and the other for the lower reel servo. The circuits on these cards control the current to the upper and lower reel drive motor brakes in response to feedback from the tape position sensor assembly. Since the reel servo circuit cards are identical, both in function and operation, only the upper reel servo circuit is discussed in the following paragraphs. See Figure 4.2-13.

4.2-45 When the machine is operating in the forward mode, the capstan rotates in a clockwise direction and a direction switch, controlled by the capstan flywheel, activates direction relay K1, via pin C on the reel servo card. Since this relay is deenergized in the forward mode (pin C at ground potential) the signal at pin W of the reel servo card is passed through current-to-voltage amplifier A1, and the contacts of K1, then to the junction of C10 and R15 (Twin T Filter), without phase inversion. In the reverse mode, relay K1 is energized and the signal at pin 6 of amplifier A1 is phase inverted by A2 and passed directly to the Twin T Filter.

4.2-46 Assume that the transport is operating in the forward mode and the tape loop in the upper plenum suddenly becomes larger than normal. When this occurs, less light will reach the upper tape position sensor due to the position of the tape in the upper plenum. Since the output current of the tape position sensor varies with tape loop position, the output of the position sensor circuit will decrease. This current decrease is applied, through pin W of the reel servo card, to a filter consisting of R1-R2 and C1-C2. The filter reduces the

ac component generated by the tape position sensor and fluctuating tape movement. The signal is then passed through assemblies A1 and A2, emitter-followers Q1 and Q2, and the driver amplifier Q3, Q4, and Q5 to provide a positive turn-on potential to Q2 (brake power amplifier located on the heat sink). When Q2 (of the heat sink) conducts more, it draws more current through the reel brake coil, thereby increasing braking and slowing the reel servo motor. Under these conditions, less tape is fed into the upper plenum and the tape loop size decreases to normal.

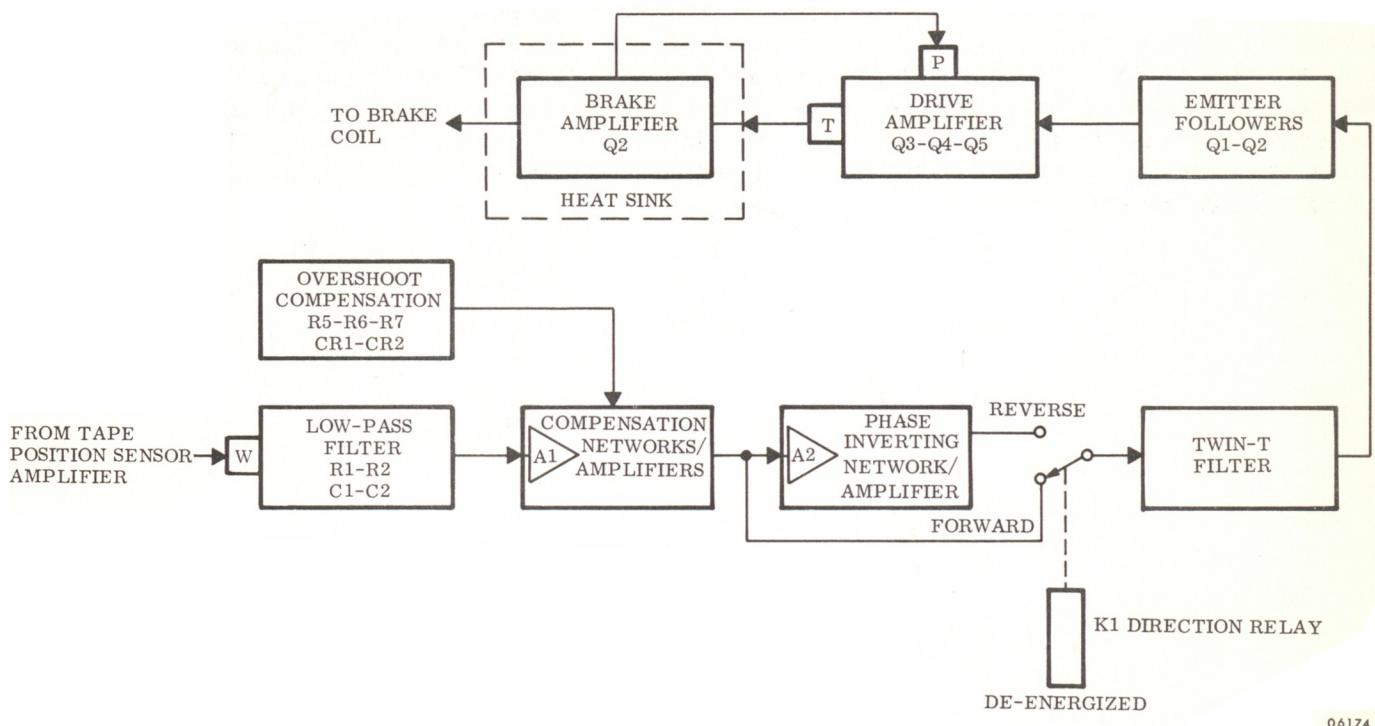


Figure 4.2-13. Typical Reel Servo Circuit (Block Diagram)

4.2-47 Should an excessive amount of tape be found in the lower plenum in the forward mode, the action of the lower reel servo would be identical to the one explained. The amount of braking would be reduced, therefore, the reel motor would pull more tape out of the plenum than was being fed to it by the capstan, and consequently, the tape loop would be reduced.

4.2-48 Overshoot compensation network R5, R6, R7, CR1 and CR2 prevents the tape loop from rapidly expanding in the plenum following a change in tape direction. For example, when changing from a forward to a reverse mode, the tape loop will momentarily tend to expand in the plenum chamber. This is the result of the following circumstances:

- The direction change command is not given to the reel motors until the capstan has reversed its direction and moved at least five degrees. This delayed command is caused by the action of the direction switch, S1.

- b. The capstan, after changing direction, will feed tape into the plenum (for the five degrees of rotation) while the reel motors are stationary and the reel servo brakes are on.

#### 4.2-49 TAPE TRANSPORT INTERLOCK CIRCUITS

The tape transport interlock circuits stop the transport if the tape breaks or when the tape supply is exhausted. They also stop the transport if the diffuser lamp fails (thereby rendering the servo systems inoperative) and start the second recorder/reproducer tape transport when the tape supply is nearly exhausted on the first transport (sequential operation). All the interlock control circuits and ballast resistors for the servo system lamps are located on the control circuits optics printed wiring assembly (card). This assembly (see schematic 1213113) also contains a +24 vdc filter for use on all gating circuits. The locations of the interlock circuit photosensors, and the light paths they monitor, are shown in Figure 4.2-14

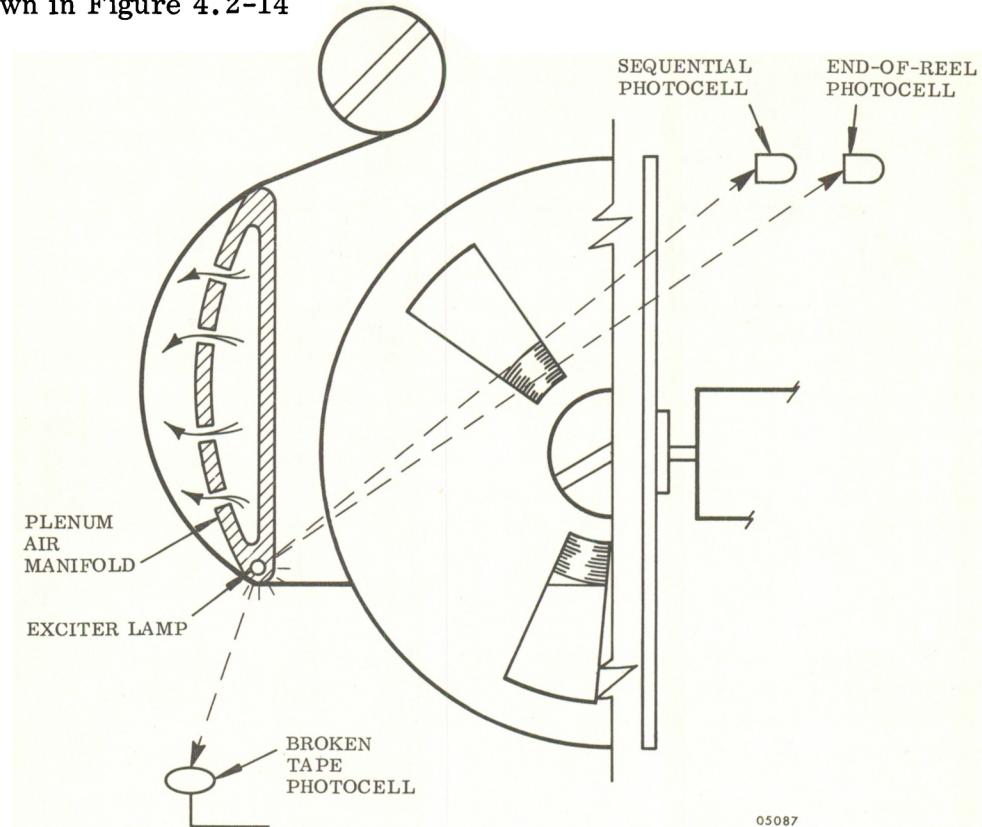


Figure 4.2-14. Transport Interlock Circuits

#### 4.2-50 END OF REEL CIRCUIT

The end of reel circuit amplifies the outputs from the end-of-reel photosensor and drives the end-of-reel relay, K105. In this circuit, transistors Q1 and Q2 function as a Schmitt trigger and Q3 is the relay driver. When the end-of-reel sensor is light-activated, its internal resistance decreases causing the voltage at pin H to increase in the positive direction. This positive voltage drives Q1 into saturation. Transistor Q2 is then cut off

driving Q3 into saturation. Q3 then provides a ground path for the end-of-reel relay K105 and the relay becomes energized dropping out the ground return path for all motion relays.

#### 4.2-51 BROKEN TAPE CIRCUIT

The broken tape circuit energizes broken tape relay K106 in response to a broken tape indication from either of the broken tape light sensors (photocells). When either (or both) of the broken tape sensors is light-activated, the internal resistance of the sensor is decreased. This causes transistors Q4 or Q5 (or both Q4 and Q5) to be driven into saturation. With Q4 or Q5 conducting heavily, transistor Q6 is also driven into saturation, and provides a ground path which permits broken tape relay K106 to become energized.

#### 4.2-52 DIFFUSER LAMP FAILURE (PROTECTION) CIRCUIT

The diffuser lamp failure circuit senses the on or off state of the lamp in the diffuser assembly that furnishes light to the sensors in the capstan and reel drive servo systems. If the lamp fails, the lamp failure circuit activates the end-of-tape circuit to turn off the transport. In this circuit, pins J and K are connected to the +10 vdc regulator circuit. Under normal conditions pin J is positive by 10.6 vdc. If the lamp fails, pins J and K are at the same potential; transistor Q11 is then cut off and CR1 and CR2 are forward biased, cutting off Q2. With Q2 cut off, Q3 conducts heavily and provides a ground path to energize end-of-reel relay K105.

#### 4.2-53 SEQUENTIAL CIRCUIT

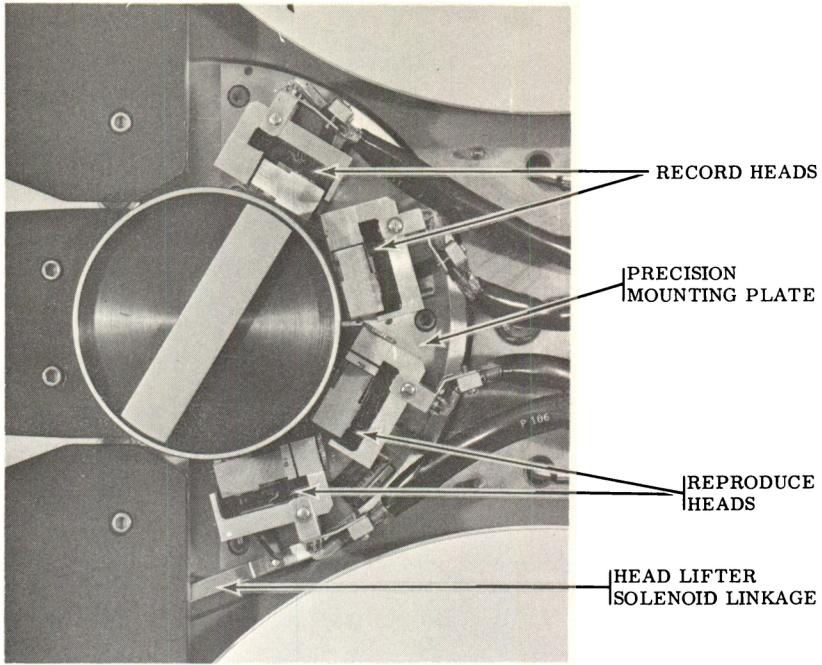
The sequential circuit provides a method of automatically placing a second recorder/reproducer into the record mode. This action is initiated by the operating recorder/reproducer prior to the time the tape reaches the end of reel. A photosensor, which is exposed to a beam of light focused tangentially across the remaining tape on the first recorder/reproducer supply reel, activates the sequential relay K109 and starts the sequential operation. Conditions such as power failure and broken tape on the first recorder/reproducer will also initiate the sequential operation described above.

#### 4.2-54 HEAD ASSEMBLY

4.2-55 The overall purpose of the head assembly (see Figure 4.2-15) is to transfer electro-magnetic signals to and from the magnetic recording tape.

4.2-56 The head assembly consists of a head mounting plate on which are mounted record and reproduce head stacks, and a solenoid-actuated head-lifter linkage. The record head stacks are fixed in azimuth relative to the head mounting plate; however, the reproduce head stacks can be adjusted plus or minus 1 degree in azimuth with an azimuth adjust screw.

4.2-57 The solenoid-actuated head-lifter linkage lifts the head stacks from the capstan. The lifting is accomplished by a retraction spring which pulls the head-lifter linkage counter-clockwise. For head-to-tape contact, the head-lifter solenoid pulls the linkage clockwise against the spring. The head linkage arm then moves out to permit a compression spring and a flexor spring to move the heads into contact with the tape and capstan.



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Figure 4.2-15. Head Assembly

#### 4.2-58 BLOWER ASSEMBLIES

4.2-59 The blower assemblies furnish air under pressure to the upper and lower plenum manifolds. They also furnish cooling air for the upper and lower reel drive motors and the capstan drive motor. Each assembly is enclosed in a housing and is mounted on the transport baseplate.

4.2-60 The upper blower assembly supplies forced air directly to the upper plenum and upper reel drive motor through flexible air ducts. Air for the lower plenum and lower reel drive motor is supplied in the same manner by the lower blower assembly. Air exhausted from the reel drive motors is used to cool the capstan drive motor.

#### 4.2-61 AIR COMPRESSOR

The air compressor provides an air bearing for the tape as it passes around the plenums. The air is forced through small holes in the upper and lower plenum assemblies, thus providing a low friction air-bearing surface for the tape.

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## SECTION III

### SIGNAL ELECTRONICS FUNCTIONS

The signal electronics functions of the direct record-reproduce, f-m record-reproduce, and pdm record-reproduce amplifiers will be found in the ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

## SECTION IV

### CONTROL CIRCUIT FUNCTIONS

#### 4.4-1 GENERAL

This section describes the various operational modes of the recorder which are achieved through actuation of back-lighted pushbuttons and switches. The modes are separated into two divisions: normal operational modes and special operational modes. Refer to Schematic number 1214292 in Chapter 6.

#### 4.4-2 NORMAL OPERATIONAL MODES

The normal operational modes are the modes generally used during normal operation of the recorder. Included in this group are the following functions: forward, fast forward, reverse, fast reverse, record (forward and reverse) and stop.

#### 4.4-3 FORWARD MODE

When the FORWARD pushbutton (S1) is depressed, the forward mode is initiated. Depression of this switch energizes the forward relay (K103) through contacts A and B of the switch. Contacts C and D override the end-of-reel relay (K105), and contacts E and F of the switch deenergize either the record relay or the fast relay. Contacts 8 and 12 of the forward relay provide 28 vac to contacts 3 and 4 of the capstan drive relay (K202). Contacts 2 and 10 of the forward relay provide reverse relay lockout, and contacts 7 and 11 of the forward relay supply ground return for the fast relay and the record relay.

#### 4.4-4 FAST FORWARD MODE

The FAST FORWARD pushbutton (S2) places the transport in the fast forward mode. When the FAST FORWARD pushbutton is depressed, contacts A and B of this switch energize the fast relay. Contacts C and D actuate the forward relay (K103).

#### 4.4-5 REVERSE MODE

Depression of the REVERSE pushbutton places the transport in the reverse mode of operation. Activation of the REVERSE pushbutton switch (S3) through contacts A and B energizes the reverse relay (K102). Contacts C and D override the end-of-reel relay, and contacts E and F deenergize either the record relay or fast relay. Contacts 5 and 9 of the reverse relay provide 28 vac to the capstan drive relay (K202). Contacts 7 and 11 provide a ground return for the fast and record relays. The forward relay is locked out through contacts 2 and 10 of the reverse relay. The reel reverse relay (K108) is energized when the capstan is in the reverse mode. Both reel motors are reversed through contacts 8 and 12 of the reel reverse relay. Contacts 1, 5, and swinger 9 of the reel reverse relay select either the upper or lower end-of-reel sensor.

#### 4.4-6 FAST REVERSE MODE

The FAST REVERSE pushbutton places the transport in the fast reverse mode of operation. Recording is not performed in this mode. When the FAST REVERSE pushbutton (S4) is depressed, the reverse relay will be actuated through contacts C and D of the pushbutton and the fast relay is energized through contacts A and B. When in the fast reverse mode, the reverse relay provides ground return for the fast reverse lamp. In fast modes contacts 2 and 10 of the fast relay are open, disabling the record relay.

#### 4.4-7 RECORD MODE

When the RECORD pushbuttons (S5 and S6) are pressed the record mode is initiated and the recording of data, through the appropriate electronics, is permitted in either forward or reverse.

4.4-8 FORWARD. The forward-record mode is activated by depressing the FORWARD pushbutton to energize the forward relay. By depressing the RECORD pushbuttons, simultaneously, the record relay (K104) is energized.

4.4-9 REVERSE. The reverse-record mode is activated by depressing the REVERSE pushbutton to energize the reverse relay. By depressing the RECORD pushbuttons, simultaneously, the record relay (K104) is energized.

#### 4.4-10 STOP MODE

The stop mode is achieved by depressing the STOP pushbutton (S7) which disables the ground return on all motion relays and deenergizes all relays in the system.

#### 4.4-11 SPECIAL OPERATIONAL MODES

The special operational modes consist of the following: auto cycle, search and sequential.

#### 4.4-12 AUTO CYCLE MODE

4.4-13 The auto cycle mode is activated by placing the AUTO CYCLE switch (S17) to either the REP or FF position. The transport will shuttle between two predetermined points on the tape as identified by settings manually preselected on the rotational counter.

4.4-14 When the AUTO CYCLE switch (S17) is placed in the REP (reproduce) position, the forward, reverse, and fast relays are controlled by S102 (forward) and S103 (reverse) rotation counter switches. The reverse and fast relays will close and latch through their respective contacts causing the transport to run in fast reverse. The heads are not in contact with the tape. As the left hand rotation counter reaches 0000 the forward counter switch closes and the forward relay is energized and latched by its own contacts. This action deenergizes the reverse and fast relays and allows the transport to operate in the forward direction at a preselected speed. The heads now come in contact with the tape. The fast reverse mode reactivates when the right hand rotation counter reaches 0000 and the switch closes.

4.4-15 In the FF (fast forward) position, the operation is similar except that the tape cycles in both the forward and reverse directions in the fast mode. During the FF cycling the heads are lifted from the tape.

4.4-16 When the AUTO CYCLE switch is placed in the OFF position the rotation counter switches are disabled.

#### 4.4-17 SEARCH MODE

The search mode which is initiated when the NORMAL-SEARCH switch (S12) is placed in the SEARCH MODE position allows a quick surveillance of recorded data when operating in the fast modes.

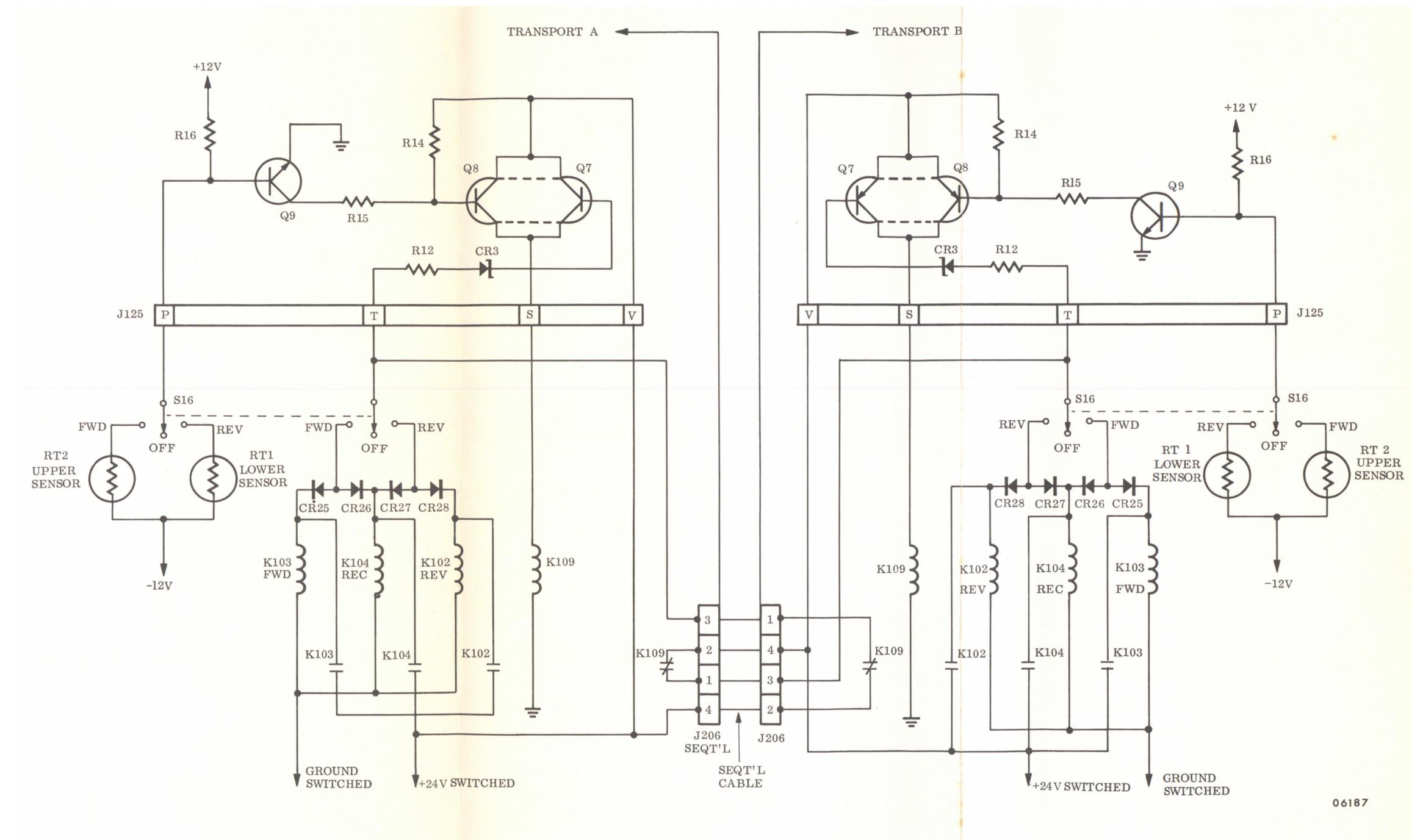
#### 4.4-18 SEQUENTIAL MODE

4.4-19 The sequential mode is initiated by SEQUENTIAL switch S16. This switch enables the automatic transfer function of data recording (refer to paragraph 4.2-53) when it is placed in the FWD (forward) or REV (reverse) position.

4.4-20 Placing the SEQUENTIAL switch in the FWD (forward) position causes Q7, Q8, and Q9 to conduct. (Refer to Figure 4.4-1 and Schematic 1213113). Q7 will hold the sequential relay K109 energized, thus inhibiting a sequential command if the transfer time is reached in any mode other than record. Upper sequential sensor RT2, is connected to the base of Q9. When the forward record command is given, the holding voltage of the forward and record relays (through their holding contacts) will back-bias their respective diodes (CR25 and CR26) and turn Q7 off. The sequential relay is still energized through Q8. Depletion of the tape on the upper reel causes light to excite the upper sequential sensor (RT2), decreasing its resistance and producing a negative voltage output to the base of Q9. This negative voltage turns off Q8 and Q9. The sequential relay becomes deenergized and, through its closed contacts, commands the subsequent recorder into the record mode, therefore completing the sequential cycle.

4.4-21 Placing S16 in the REV position causes the lower sequential sensor RT1, to be selected and allows K104 (Rec) and K102 (Rev) to be energized if either a sequential or a reverse record command is given. Under these conditions the recorder is placed in the reverse record mode.

4.4-22 When the SEQUENTIAL switch is placed in the OFF position, transistors Q8 and Q9 will conduct, energizing the sequential relay (K109). In the energized state, the relay contacts are open and the sequential operation will not occur.



**Figure 4.4-1.** Sequential Circuit

## SECTION V

### POWER SUPPLY FUNCTIONS

#### 4.5-1 GENERAL

This section describes the functions of the +24 vdc power supply and power supply regulators employed in the tape transport system. Power to the control and servo systems is provided by way of the regulators. Included in this section are the +24 vdc power supply and regulator, -27 vdc and -12 vdc power supply regulators, and the +12 vdc and +10 vdc power supply regulators. Refer to Chapter 5 for maintenance procedures concerning the regulator cards. The ES-100 signal electronics use their own dual power supply which is located in one of the module trays. For a detailed description of the dual power supply, consult the ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

#### 4.5-2 +24 VDC POWER SUPPLY AND REGULATOR (Schematic Number 1212728)

The +24 volt power supply, located in the system control bay, provides regulated 24 vdc to various areas of the control bay by the use of a switching transistor (Q5), placed in the negative leg of the power supply. See Figure 4.5-1. Under normal load condition, voltage regulation is accomplished by a voltage sensor circuit, Q2 and Q3, which detects and amplifies any changes in the output voltage. This voltage change controls driver Q1, which in turn, causes switching transistor Q5 to change switching frequency. Since the switching frequency varies with the power supply load demands, a decrease in load current will cause a corresponding decrease in switching frequency. The frequency increases for higher load currents up to an overload point at which overload protector Q4 senses a higher than normal voltage. As a result, Q4 turns on causing transistor Q5 to switch at a lower frequency rate, thereby reducing the power supply output current to a safe level.

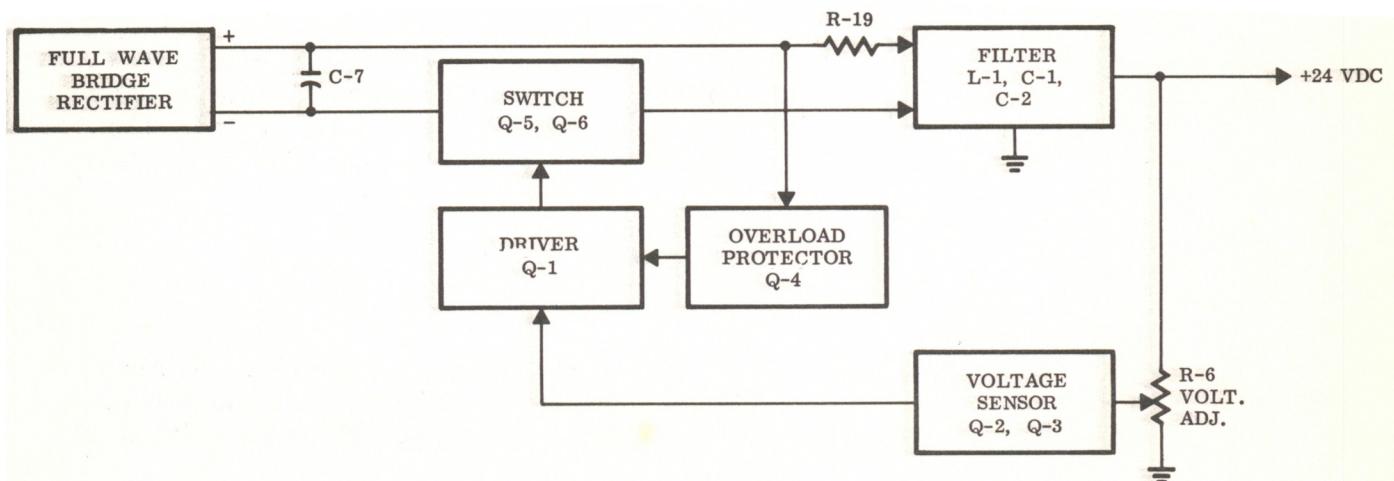


Figure 4.5-1. +24 VDC Power Supply Regulator, Block Diagram

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4.5-3 -27 VDC AND -12 VDC POWER SUPPLY REGULATORS  
 (Schematic Number 1212593)

4.5-4 The -27 vdc and -12 vdc power supply regulators, shown in Figure 4.5-2, are two assemblies mounted on one printed circuit card. Although the assemblies are identical, the reference designations are different; therefore, only the -12 vdc portion will be referred to.

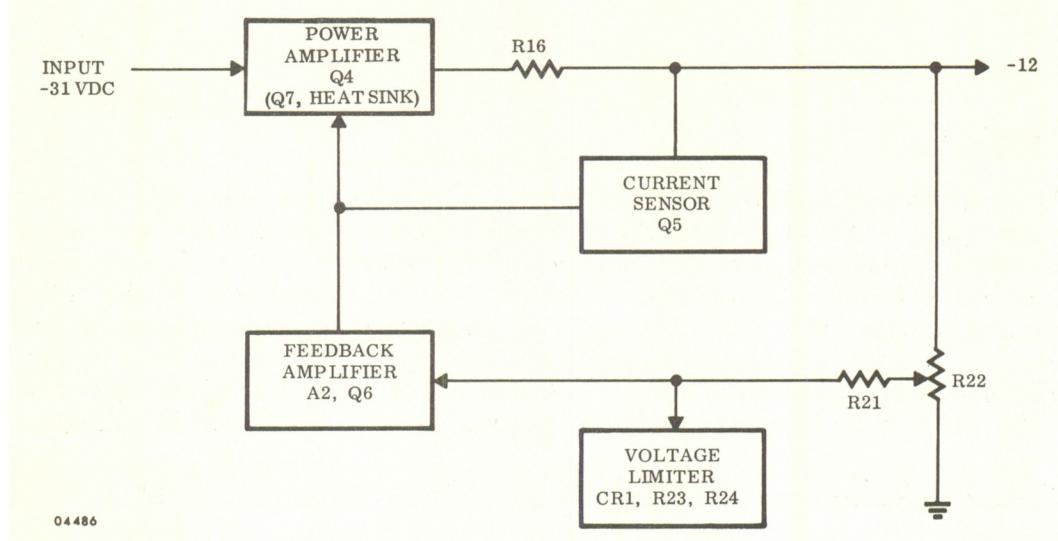


Figure 4.5-2. -27 VDC and -12 VDC Power Supply Regulators,  
 Block Diagram

4.5-5 The assembly, A2, is a voltage reference unit consisting of a zener diode and a transistor. Bias to the diode is supplied by the resistor R18. The voltage between the anode of the diode and base of the assembly transistor is constant, and any deviation in this voltage causes a change in the collector current of the transistor. The potentiometer R22 provides means of adjusting the output voltage of the assembly. The collector current of the assembly transistor is limited by the resistor, R19, which also provides base protection for Q6 from excessive current surges. Q6 amplifies the collector current of the transistor in assembly A2. The amplified current is then applied to the base of Q4. The combination of the heat sink power amplifier Q7, and Q4 make up a high current gain amplifier of unity voltage gain. When the output current of the combination attains a preselected value, the transistor Q5 conducts. This conduction decreases the output voltage of Q4 and Q7. The maximum output of the regulator is limited by a clamping circuit of diode CR1 and resistors R23 and R24.

4.5-6 +12 VDC AND +10 VDC POWER SUPPLY REGULATORS  
 (Schematic Number 1212876)

4.5-7 The +12 vdc and +10 vdc power supply regulators, shown in Figure 4.5-3, are two regulator assemblies mounted on one printed circuit card. Although the assemblies are identical, the reference designations are different; therefore, only the +12 vdc portion will be referred to.

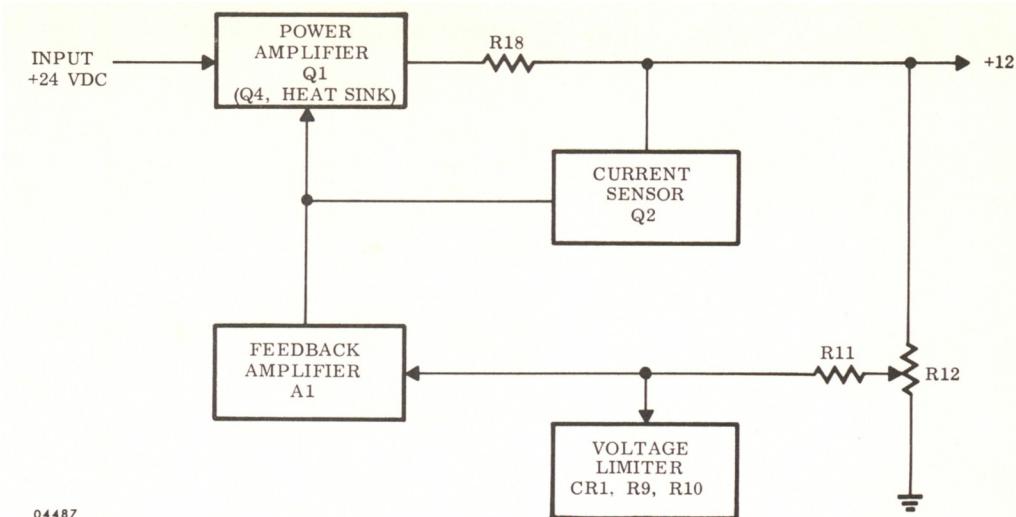


Figure 4.5-3. +12 VDC and +10 VDC Power Supply Regulators, Block Diagram

4.5-8 The assembly A1 is a voltage reference unit consisting of a zener diode and a transistor. Bias to the diode is supplied by the resistor R5. The voltage between the anode of the diode and the base of the assembly transistor is constant, and any deviation in this voltage causes a change in the collector current of the transistor. The potentiometer R12 provides a means of adjusting the output voltage of the assembly. The collector current of the assembly transistor is limited by the resistor R3 which also provides base protection for Q1 from excessive current surges. Q1 amplifies the collector current of the assembly transistor. The combination of the heat sink transistor Q4 and power transistor Q1 make up a unity voltage gain, high current gain amplifier. When the output current of the combination attains a preselected value, the transistor Q2 conducts. This conduction decreases the output voltage of Q1 and Q4. The maximum output of the regulator is limited by a clamping circuit of diode CR1 and resistors R9 and R10.

## **CHAPTER 5**

### **MAINTENANCE**

**5.0-1**

## SECTION I

### PREVENTIVE MAINTENANCE

#### 5.1-1 INTRODUCTION

Continued satisfactory performance of the FR-1800L Recorder/Reproducer can be ensured only by adhering to a planned program of preventive maintenance. The manufacturers recommended preventive maintenance schedule, based on hours of operation, is provided in Table 5.1-1.

Table 5.1-1. Preventive Maintenance Schedule

TASKS	FREQUENCY OF TASKS	PARAGRAPH REFERENCE
HEAD DEGAUSSING	Every 8 hours.	5.1-2
HEAD CLEANING	Preceding each data recording.	5.1-6
BLOWER FILTERS INSPECTION AND REPLACEMENT	Every 100 to 200 hours or sooner.	5.1-4
CAPSTAN CLEANING	Preceding each data recording.	5.1-5
PLENUM GUIDE CLEANING	Every 10 to 20 hours (or check periodically for oxide accumulation).	5.1-7
CAPSTAN SERVO ADJUSTMENT	Every 100 hours or when components are replaced.	5.2-20
REEL SERVO ADJUSTMENT	Every 100 hours or when components are replaced.	5.2-19
AIR COMPRESSOR	Every 100 hours.	5.1-8

**5.1-2      HEAD DEGAUSSING**

The record and reproduce heads must be degaussed whenever the recorder has been moved, bumped, or reoriented; or following any major electronic change. If none of the above occurs, head degaussing should be performed every 8 hours. Proceed with the following head degaussing instructions.

- a. Turn off power.
- b. Open head cover door.
- c. Remove any recorded tape to a location at least 3 feet from the head assembly.
- d. Remove the capstan. (See step a of paragraph 5.1-5.)
- e. Remove connectors from head assembly.

**CAUTION**

THE DEGAUSSER ASSEMBLY MUST BE AT LEAST THREE FEET FROM THE HEAD ASSEMBLY PRIOR TO CONNECTING TO POWER SOURCE SINCE THE INITIAL SURGE OF CURRENT MAY MAGNETIZE THE COMPLETE HEAD ASSEMBLY.

- f. Connect the degausser to power source (105 to 125 vac), keeping the instrument at least 3 feet from the head assembly.
- g. Slowly move the degausser into position over the reproduce head stack following the path shown in Figure 5.1-1. Carefully place the degausser pole tips in light contact with the front of the head stack keeping the degausser tip parallel to the head surface.
- h. Move the degausser pole tips slowly outward along the head stack centerline, pausing at each head for a period of 10 seconds (minimum) before proceeding to the adjacent head.
- i. Repeat the same procedure for each of the remaining reproduce and record head stacks.
- j. Following the completion of the head degaussing, slowly remove the degausser at least 3 feet from the head assemblies prior to disconnecting power. Quick removal of the degausser will cause a sudden collapse of the magnetic field which, in turn, may remagnetize the head assembly.

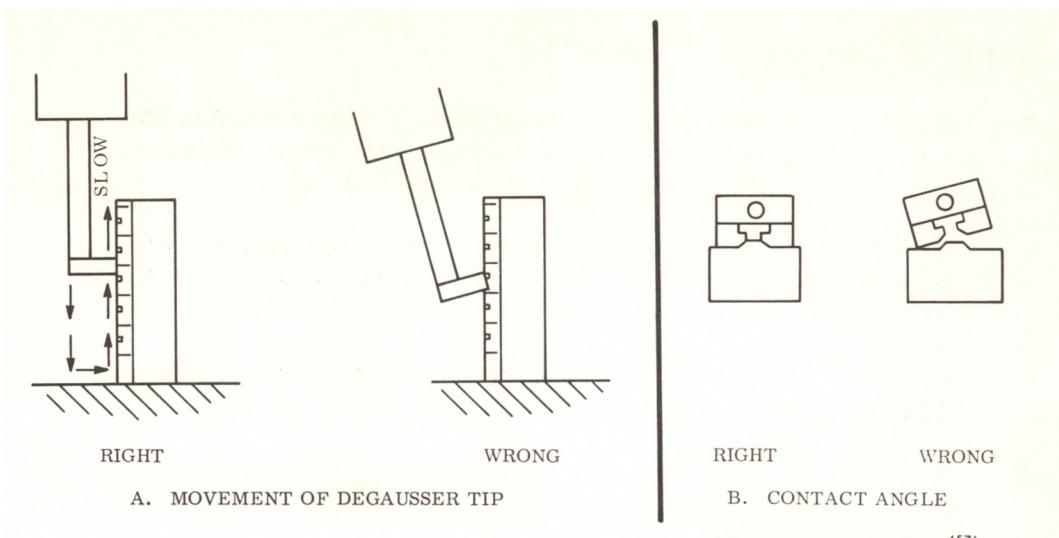


Figure 5.1-1. Head Degaussing

**5.1-3 CLEANING AND INSPECTION****5.1-4 BLOWER FILTERS - INSPECTION AND REPLACEMENT**

The blower filters cover the intakes of the upper and lower blower motors that supply air to the plenums and servo motors. It is recommended that the blower filters be inspected periodically and changed when they are noticeably dirty, or every 100 to 200 hours, depending upon the environment in which the tape transport is operated. To change a filter, perform the following procedure:

- a. Pull the rubber clamping ring from the end of the blower housing assembly. The filter and its protective screen will be removed with the clamping ring.
- b. Check the blower visually for any accumulation of dust and wipe with a clean, lint free cloth.
- c. Replace the dirty filter with a clean one.
- d. Reinstall the rubber clamping ring, filter, and screen on the end of the blower housing.

**NOTE**

An extremely dirty filter will cause a blockage of air flow. This will affect tape tension, and may cause erratic operation of the reel servos. Also, with reduced cooling air the reel motors and capstan motor will tend to overheat.

**5.1-5 CAPSTAN CLEANING**

- a. Remove the capstan from the capstan shaft by holding the capstan hub with one hand and turning the holddown bar in a counterclockwise direction with the other hand.
- b. Clean the capstan with hot soapy water and a stiff bristle brush. Particular attention should be paid to cleaning the grooves in the elastomer surface of the capstan.
- c. Rinse the capstan in clean water and thoroughly dry the assembly with a lint free cloth before reinstalling.
- d. Replace the capstan on the capstan shaft and, holding the capstan with one hand, turn the holddown bar in a clockwise direction with the other hand.

**NOTE**

Location marks are scribed on the capstan and the capstan shaft. Align these marks when replacing the capstan to achieve the least amount of flutter.

**5.1-6 HEAD CLEANING**

The head cleaning procedure is outlined in the following steps:

**CAUTION**

USE ONLY AMPEX HEAD CLEANER (PART NO. 087-007). OTHER CHEMICALS OR SOLVENTS WILL DAMAGE THE HEAD ASSEMBLIES BY SOFTENING THE BONDING AGENT BETWEEN THE CORE LAMINATIONS AND SHIELDS.

- a. Remove the capstan.
- b. Dip a cotton swab in the Ampex head cleaner. Drain off the excess fluid from the swab and clean the exposed head faces with back-and-forth (scrubbing) motion in line with the head gaps.
- c. Repeat the cleaning action with a clean swab for a final touch up cleaning. All traces of tape oxide must be removed.
- d. Replace the capstan on its shaft.

**5.1-7 PLENUM GUIDE CLEANING**

- a. Remove the three holddown screws that secure each plenum cover to the transport baseplate and remove the covers.
- b. Remove the plenums from their locating pins.
- c. Clean the plenum covers, plenum guides and mounting plate with AMPEX cleaner No. 087-007.

**NOTE**

While the plenum covers and plenum guides are removed for cleaning, check the plenum mounting plate alignment (refer to paragraph 5.2-6).

- d. Replace the plenums by reversing the removal procedure.

**5.1-8 INSPECTION AND CLEANING OF AIR COMPRESSOR**

The air compressor provides an air bearing for the tape as it passes around the plenum assemblies. The normal output of the compressor must be 2.5 to 3.5 psi for transports handling 1-inch tape and 4.0 to 5.5 psi for transports handling 1/2-inch tape. For transports handling 1/2-inch tape, the normal output will be 4.5 to 5.5 psi. If the reading on the gage is less than normal, check for leaks in the system and clean the input air filter. If the reading is greater than normal, check for plugged air holes in the plenum and clean the output air filter. A need for cleaning is also indicated by an excessive accumulation of carbon dust in the air compressor filter jars. A trace of carbon dust in these jars is normal; if there is more than a trace, clean the air system as follows:

- a. Remove the filter jars (see Figure 5.1-2).
- b. Remove the filter supports.
- c. Slip the filters off the supports.
- d. Soak the filters in alcohol, flexing them to ensure thorough cleaning. Dry the filters with compressed air.
- e. Replace the input filter jar (less filter and support).
- f. Remove both intake and output air hoses.
- g. Turn on transport power.
- h. Hold a rag at the exhaust port of the output filter to keep alcohol and residue from splashing on machine parts.
- i. Slowly pour alcohol into the intake port of the input filter until the alcohol begins to circulate through the pump and the output filter assembly. After a few minutes, turn off the transport.

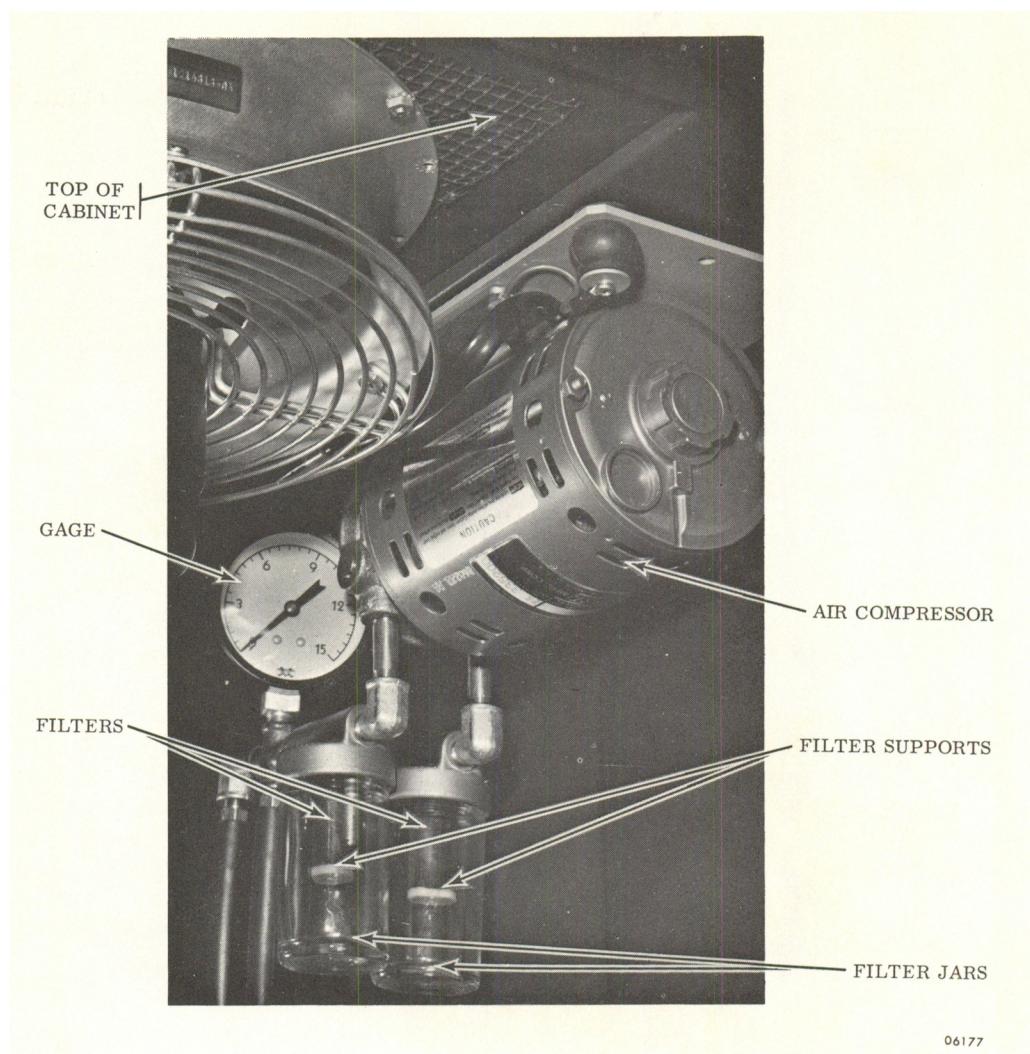


Figure 5.1-2. Air Compressor

- j. Remove the rag from the output exhaust.
- k. Empty and dry the input filter jar.
- l. Slip the filters over the supports. Replace and tighten the supports; then replace and tighten the filter jars.
- m. Turn the power on. Check the filters and hoses for leaks.

NOTE

If cleaning fails to restore the air system output to normal, the pump vanes may be worn or broken. For replacement of pump vanes, refer to paragraph 5.2-32.

SECTION II  
CORRECTIVE MAINTENANCE

5.2-1      GENERAL

This section contains instruction for troubleshooting, performance checkout, adjustment, and repair of the FR-1800L.

**WARNING**

OBSERVE CAUTION WHILE ADJUSTMENTS ARE BEING MADE ON ELECTRICALLY ENERGIZED EQUIPMENT. FAILURE TO EXERCISE CAUTION MAY RESULT IN SERIOUS INJURY TO PERSONNEL.

5.2-2      TEST EQUIPMENT AND TOOLS REQUIRED

Listed in the table below are the tools and test equipment required to perform the alignment or adjustments listed in this chapter.

Table 5.2-1. List of Tools and Test Equipment

ITEM NAME	TYPE AND MODEL NUMBER
24-inch standard steel straightedge	Brown and Sharpe, model #528 or equivalent
48 oz. spring scale	Schrader 48 oz. #8826 or equivalent
Thickness gage	Lufkin model #109 or equivalent
Shim stock	0.005-inch thickness, 1-inch wide by 6-inches long
3/32" Allen T- bar with 10-inch or longer shaft	
Tension dynamometer 50 to 500 gram scale	Correx model 50-500 or equivalent

Table 5.2-1. List of Tools and Test Equipment (Continued)

ITEM NAME	TYPE AND MODEL NUMBER
Oscilloscope	Tektronix model #535A with dual trace preamplifier or equivalent
Volt-ohm-milliammeter	Simpson model #262 or equivalent (20,000 ohms/volt)
AC vacuum tube voltmeter	Hewlett-Packard model #400D or equivalent
Digital voltmeter	Non-Linear Systems model #401 or equivalent
DC Power Supply	Hewlett-Packard model #721 or equivalent
Oscillator	Hewlett-Packard model #651 or equivalent

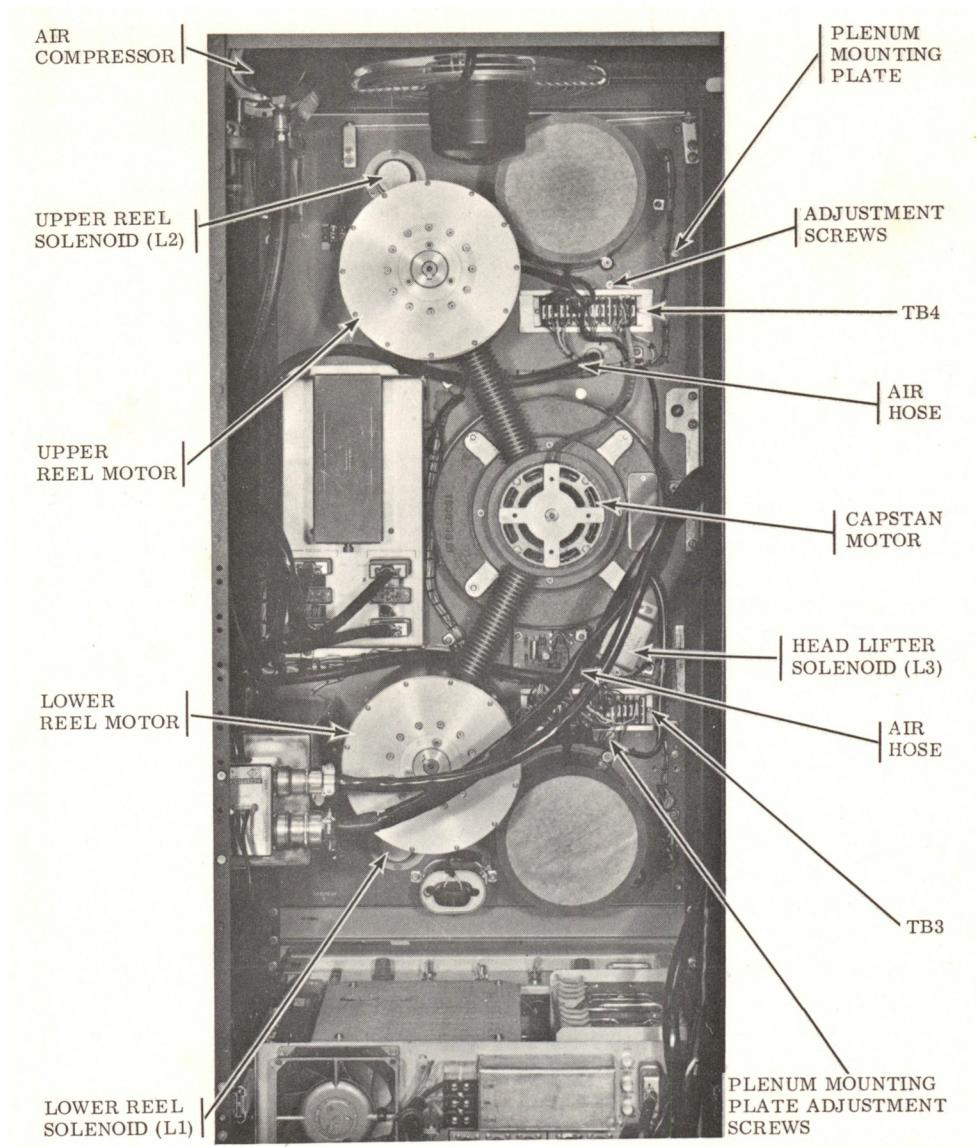
**5.2-3 TAPE TRANSPORT ADJUSTMENTS****5.2-4 REEL BRAKE INSPECTION AND ADJUSTMENT**

The reel brakes should be inspected every 500 hours. The procedure is as follows:

- a. Turn system power off.
- b. Loosen the setscrew that holds the hub to the reel motor shaft and pull the brake assembly off the shaft. See Figure 5.2-1.
- c. Remove all traces of dust and grit from the three-piece brake lining and stator coil housing with a vacuum cleaner, brush, or lint free cloth.

**NOTE**

If the linings are badly worn (thin), they should be replaced. The linings may be removed by cutting them free from the stator coil housing with a sharp knife. Remove all traces of epoxy. Replace the linings by gluing new ones in place. Care should be taken to position the new linings so that they are concentric with the stator coil housing surface and equally spaced.



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Figure 5.2-1. Transport Alignment and Adjustment Points

- d. Replace the brake assembly on the reel motor shaft. Do not tighten the hub setscrew.
- e. Insert a 0.020-inch feeler gage between the brake lining and the movable armature. Move the brake assembly into contact with the feeler gage and brake lining surface.
- f. Tighten the hub setscrew. Measure the spacing between the armature and brake lining at several points around the brake assembly. The spacing should be 0.020-inches ( $\pm 0.005$  inches). Readjust spacing, if necessary.

#### 5.2-5 REEL EMERGENCY BRAKE ADJUSTMENT

The reel emergency brakes should be checked every 500 hours and adjusted; if necessary, according to the following procedure:

- a. Remove power from tape transport.
- b. Loosen reel brake armature hub setscrew (see Figure 5.2-1) located at the rear of reel motor assembly, and move reel motor brake assembly approximately 1/8-inch from brake linings.
- c. Loosen three clamping screws which secure the brake solenoid (see drawing number 1212500).
- d. Disconnect wires to the brake solenoid. (See Figure 5.2-1.)
- e. Apply 24 vdc to the brake solenoid. (Brakes will release.)

#### NOTE

If a dc power supply is not available, 24 vdc can be obtained at TB4 located under the upper blower motor. (See Figure 5.2-1.) The connection is made to the eighth terminal from the right. Connect one lead from the brake solenoid to this terminal and ground the other lead. Remove the two reel servo cards from the system control bay to prevent reel motor and servo brake operation. Turn on system power only.

- f. Install an empty tape reel on the turntable to be adjusted and attach a 3-foot length of nylon cord (or some other suitable material) to the reel hub. Wrap several turns around the hub in either direction. At the end of the cord attach a spring scale.
- g. Rotate solenoid body (reducing slack in reel motor brake cord) until the amount of brake drag is no more than 2 ounces (as indicated on spring scale) in either direction of reel rotation. Clamp the solenoid body in this position.

- h. Remove power from the solenoid.
- i. Check the high and low brake torque using the spring scale and cord method described in step f. Refer to Table 5.2-2 for values and direction of torque.

**NOTE**

To maintain a constant reading on the spring scale, the tests in Table 5.2-2 should be taken while pulling the scale at a constant rate.

Table 5.2-2. Reel Emergency Brake Torque Test

REEL	TORQUE	DIRECTION OF FORCE	FORCE IN OUNCES
Upper	Low	Clockwise	5-8 Ounces
Lower	Low	Counterclockwise	5-8 Ounces
Upper	High	Counterclockwise	22 Ounces (minimum)
Lower	High	Clockwise	22 Ounces (minimum)

- j. Repeat steps a through i if unable to obtain values shown in Table 5.2-2. A troubleshooting procedure is shown in Table 5.2-3.

Table 5.2-3. Reel Emergency Brake Troubleshooting Chart

OBSERVED FAULT	REMARKS	CORRECTIVE PROCEDURE
1. High torque pull is less than 22 ounces.  (Typically 32 ounces)	Brake solenoid improperly adjusted.	Adjust brake solenoid.
	Coefficient of friction too low	Recoat (spray) reel motor pulley and cord with lubricant, solid film (part number 087-608).
	Weak bellcrank spring (Ref. 1212500, sheet 2)	Replace bellcrank spring.
	Weak solenoid spring.	Adjust or replace spring.

Table 5.2-3. Reel Emergency Brake Troubleshooting Chart (Continued)

OBSERVED FAULT	REMARKS	CORRECTIVE PROCEDURE
2. Low torque pull is less than 5 ounces.	Brake solenoid improperly adjusted.	Adjust brake solenoid.
	Coefficient of friction too low.	Recoat reel motor pulley and cord. (See item 1 for type of lubricant)
	Weak solenoid spring.	Adjust or replace.
3. Low torque pull is greater than 8 ounces.	Brake solenoid improperly adjusted.	Adjust brake solenoid.
	Brake solenoid spring too strong.	Adjust or replace.
4. Drag (brakes released) is greater than 2 ounces.	Brake solenoid improperly adjusted.	Adjust brake solenoid.
	Coefficient of friction too high.	Recoat reel motor pulley and cord. (See item 1 for type of lubricant)
	Improper wrap of brake cord.	Adjust brake cord.

k. When emergency brakes are properly adjusted, perform the following:

1. Replace reel servo brake assembly as described in paragraph 5.2-4.
2. Replace reel servo cords in system control bay.
3. Reconnect emergency brake solenoid leads.

#### 5.2-6 PLENUM MOUNTING PLATE ALIGNMENT

The plenum mounting plate is held in position on the capstan housing by a precision spacer block and four large screws. Since the spacer block and screws are at the center of the mounting plate, a slight curvature of the plate might be experienced when the screws are tightened. In order to assure that the mounting plate is perfectly flat from top to bottom, four pairs of adjustment screws have been provided to permit alignment.

- a. Turn system power off.
- b. Remove plenum covers and plenums.
- c. Remove lamp diffuser housing.
- d. Place a 24-inch standard steel straightedge vertically on the plenum mounting plate. (See Figure 5.2-2.)

**NOTE**

If no light can be seen between the straightedge and the mounting plate no adjustment is needed. If light is observed, the plate is out of alignment.

- e. Adjust the adjustment screws until no light can be seen between the straightedge and the mounting plate.

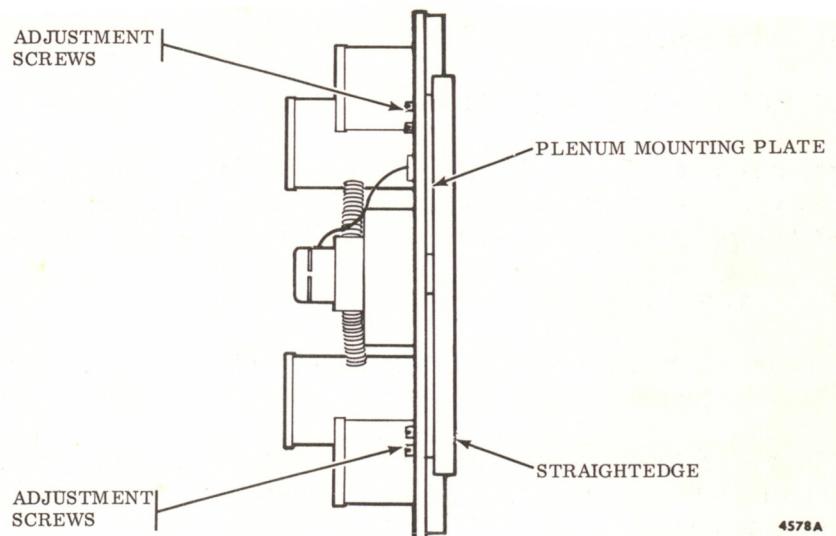


Figure 5.2-2. Plenum Mounting Plate Alignment

#### 5.2-7 TURNTABLE ALIGNMENT

Turntable height is adjusted by moving the turntable assembly in or out along the reel motor shaft. Correct positioning of the turntable is accomplished in the following manner:

- a. Turn system power off.
- b. Remove the plenum cover plates.

- c. Remove the plenums.
- d. Place an empty reel on the turntable to be adjusted and lock firmly in place with the holddown knob.
- e. Loosen the Allen setscrew in the flange of the turntable with Allen T-bar.
- f. Place the plenum flat against the plenum mounting plate and position the reel so that the end of the plenum will slide into the empty reel.
- g. Adjust the turntable height so that there is equal clearance between the plenum and the inner surfaces of the reel flanges.

NOTE

Bent or warped reels cannot be used if correct turntable alignment is to be achieved.

- h. Tighten the setscrew. Recheck clearance by rotating the reel with the plenum in place (as in step f and step g).
- i. Set the other turntable height by performing steps a through h.

5.2-8      LAMP DIFFUSER HOUSING ALIGNMENT

The lamp diffuser housing, located to the left of the capstan, is held in place by two Allen-head screws. The lamp diffuser assembly should be as close to the capstan assembly as possible without touching it. The lamp diffuser assembly is adjusted as follows:

- a. Turn system power off.
- b. Loosen the two Allen-head screws that hold the lamp diffuser housing and shield in place.
- c. Place a strip of 0.005-inch shim stock (approximately 6-inches long and 1-inch wide) around the capstan and in between the capstan and lamp diffuser housing.
- d. Hold the lamp diffuser housing against the shim stock.
- e. Tighten the two Allen screws.
- f. Remove shim stock and rotate the capstan by hand to make sure it does not scrape on the diffuser housing. Nominal clearance is 0.005-inches. Maximum clearance is 0.010-inches. Readjust, if necessary.

## 5.2-9 HEAD LIFTER SOLENOID ADJUSTMENT

The head-lifter solenoid is mounted on an adjustable bracket that is secured to the transport base place with two cap screws. See Figure 5.2-1. When these screws are loosened, the bracket can be rotated on its axis to adjust the position of the solenoid. Incorrect adjustment of this solenoid will prevent the heads from seating firmly on tape or lifting completely from the tape when desired. The check for proper adjustment of head-lifter solenoid is as follows:

- a. Turn system power on and transport power off.
- b. Set the NORMAL-SEARCH switch (S12) to SEARCH. All heads should come in contact with the capstan.
- c. Slowly move (manually) the head-lifter linkage (see Figure 5.2-3) by applying pressure (counterclockwise) to the odd reproduce head-lifter linkage arm until one of the heads begin to move away from the capstan. If the solenoid is properly adjusted, a clearance will exist between the head-lifter linkage arm and the head-lifter screw.
- d. Set the NORMAL-SEARCH switch to NORMAL. There should be visible clearance between the capstan and all heads.

### NOTE

If conditions in steps a through d are not met, proceed to step e for adjustment procedures.

- e. Turn the system power on and the transport power off.
- f. Set the NORMAL-SEARCH switch to SEARCH.
- g. Open the transport door and base plate.
- h. Loosen the two holddown screws on the solenoid mounting bracket. See Figure 5.2-1.

### NOTE

The solenoid linkage adjustment must be made with the capstan on the capstan shaft.

- i. Rotate the solenoid mounting bracket while watching for the head-lifter linkage arms to disengage from the head-lifter screw in each head stack. To insure clearance, continue rotating the mounting bracket a small amount in the same direction after disengagement of the head-lifter linkage arm and the head-lifter screws.

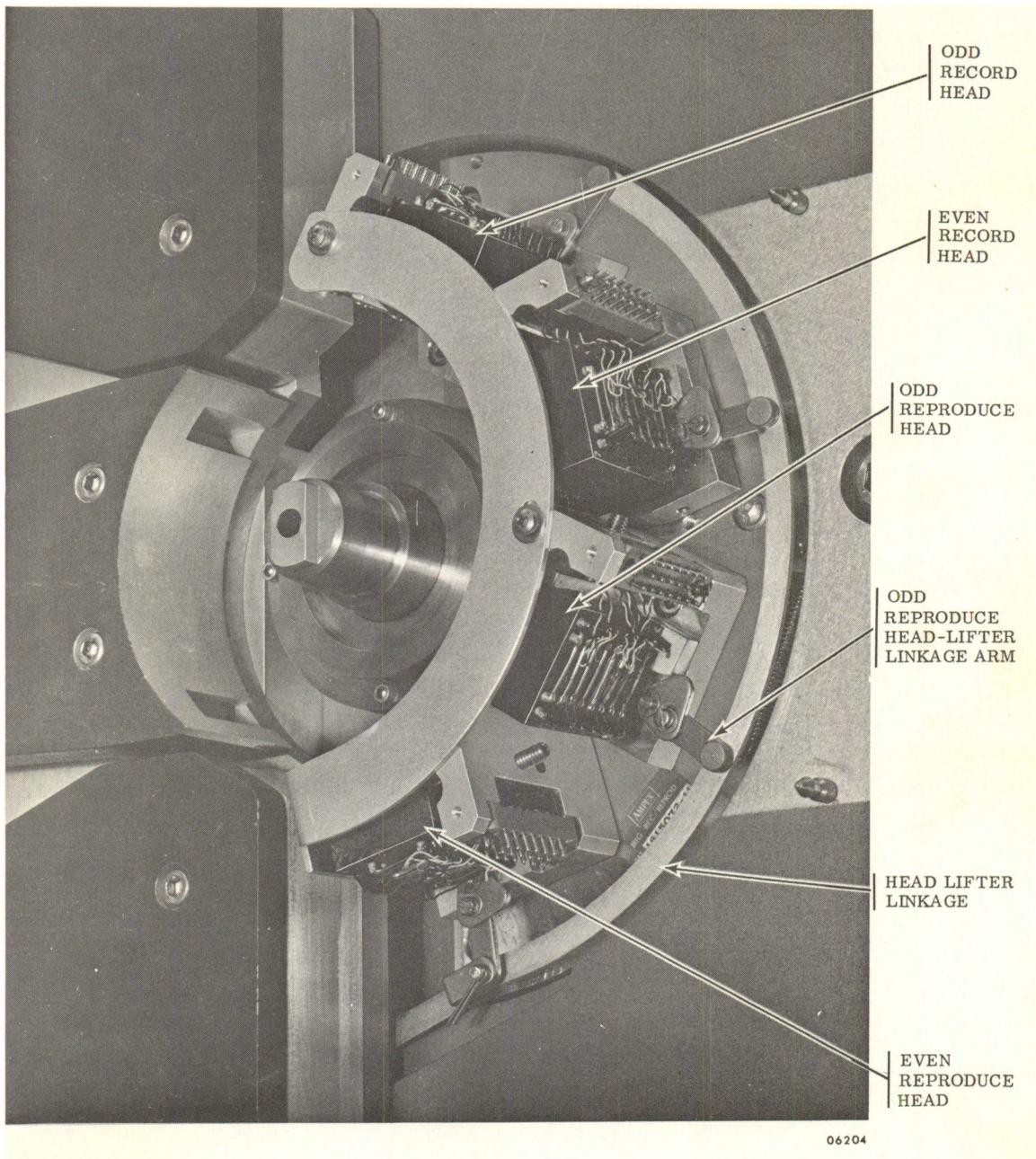


Figure 5.2-3. Head Assembly (Shown with capstan removed)

- j. Lock the solenoid in place by tightening its two mounting screws. At this point, all of the head-lifter screws are just disengaged.

**CAUTION**

ADJUSTMENT OF HEAD-LIFTER SCREWS IS  
FACTORY SET AND SHOULD NOT BE DISTURBED.

- k. To check for proper adjustment, repeat steps a through d.

#### 5.2-10 CHECK FOR INSUFFICIENT HEAD PRESSURE

It is essential that the heads contact the tape with a sufficient amount of pressure to insure proper recording and reproducing of data. If a loss of signal output indicates a lack of head pressure, perform the following procedure before attempting to adjust heads.

NOTE

The following signal levels are applicable to direct and f-m systems only. For PDM specifications, consult ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

- a. Turn transport power off and install a reel of degaussed tape on the upper turntable.
- b. Connect an oscillator (see Table 5.2-1) to the channel 1 record input jack and set the frequency to 1 kHz at a 1v (rms) signal level.
- c. Connect an ac-vtvm and oscilloscope to channel 1 reproduce output jack and set the equipment to monitor the 1v (rms) signal.
- d. Select the highest recording speed, and place the transport in the forward record mode. The output signal should be a 1v (rms) sinewave.

**CAUTION**

IN THE FOLLOWING STEPS, EXCESSIVE PRESSURE CAN RESULT IN DAMAGE TO THE HEAD STACKS.

- e. Apply finger pressure simultaneously to the movable portion of both record and reproduce head stacks which contain the test channel (channel 1 in this case).
- f. Observe the oscilloscope. If head pressure is out of adjustment, a slight pressure on the heads will show a substantial increase in the output signal. If the heads are properly adjusted, the applied pressure will show only a slight increase in signal.

**NOTE**

If signal level is low and step f does not produce a substantial increase of signal level, do not increase head pressure. Degauss the heads, and perform the record and reproduce signal electronics alignment outlined in ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

**5.2-11 HEAD PRESSURE ADJUSTMENT AND MEASUREMENT**

Head pressure measurements and adjustments are extremely important for proper recording and reproduction of data. Low head pressure will limit frequency response and cause faulty recording and reproduction while too much pressure will cause excessive head wear and tape damage. Before beginning the head pressure adjustment and measurements, perform the head and capstan cleaning and the head degaussing procedures outlined in Chapter 5, Section I. The adjustment procedure is as follows:

**CAUTION**

HEAD ASSEMBLIES ARE SHIPPED FROM THE FACTORY WITH PROPER HEAD PRESSURE ADJUSTMENT. ANY ATTEMPT TO INCREASE HEAD PRESSURE COULD RESULT IN DAMAGE OR EXCESSIVE WEAR, OR BOTH, TO THE HEADS, UNLESS ADJUSTMENT IS MADE ACCORDING TO FOLLOWING PROCEDURES.

- a. Install a reel of degaussed tape on the upper turntable.

**NOTE**

The following signal levels are applicable only to direct and f-m systems. For PDM specifications, consult ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

- b. Connect an oscillator to channel 1 record input jack and set the frequency to 1 kHz with a level of 1v (rms).
- c. Connect an ac-vtvm and oscilloscope to channel 1 reproduce output jack and set the equipment to monitor 1v (rms) signal.
- d. Select the highest recording speed, and place the transport in the forward record mode.

## NOTE

In the following step, adjust only those heads which responded to finger pressure.

- e. Adjust the reproduce head pressure screw 1/8 turn clockwise and observe the output signal. If no signal is observed, adjust the record head pressure screw an additional 1/8 turn clockwise. Continue these adjustments until a signal appears at the output.
- f. Increase the oscillator frequency until the upper limits of the electronics is reached. If the upper limit signal is weak or missing, when the selected channel is known to function at 1 kHz, carefully degauss the heads and readjust the bias as described in ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).
- g. Adjust head pressure screws as outlined in step e, if necessary, to obtain the upper frequency limit.
- h. Observe the output signal amplitude and adjust head pressure until 90% amplitude stability is achieved.

**CAUTION**

DO NOT ATTEMPT TO EXCEED 90% STABILITY  
OR SERIOUS REDUCTION OF HEAD LIFE WILL  
RESULT.

- i. Perform steps a through h with the test equipment connected to channel 7 for 1/2-inch heads, or channel 13 for 1-inch heads.
- j. Perform steps a through h for the other record/reproduce head stacks starting with channel 2.
- k. Reconnect the test equipment to the center channel of each head stack. For 1-inch tape systems, connect to channel 7 for odd record/reproduce head pairs and channel 8 for even record/reproduce pairs. For 1/2-inch tape systems, connect to channel 3 or 5 for odd record/reproduce pairs and channel 4 for even record/reproduce pairs.
- l. Set the oscillator to the highest frequency limit of the electronics at a level of 1v (rms).
- m. Select the highest tape speed and place the transport in the forward record mode.
- n. Place the measuring arm of the tension dynamometer under the head pressure reference stud on the head frame assembly and lift the head from the tape. See Figure 5.2-4.

- o. As the head is lifted from the tape, monitor the output signal from the reproduce module when the level drops 6 db (50%). Observe the reading on the dynamometer scale. Head pressure must not exceed 200 grams for 1/2 inch heads or 300 grams for 1 inch heads.

**NOTE**

The pressures obtained in step o are maximum values.

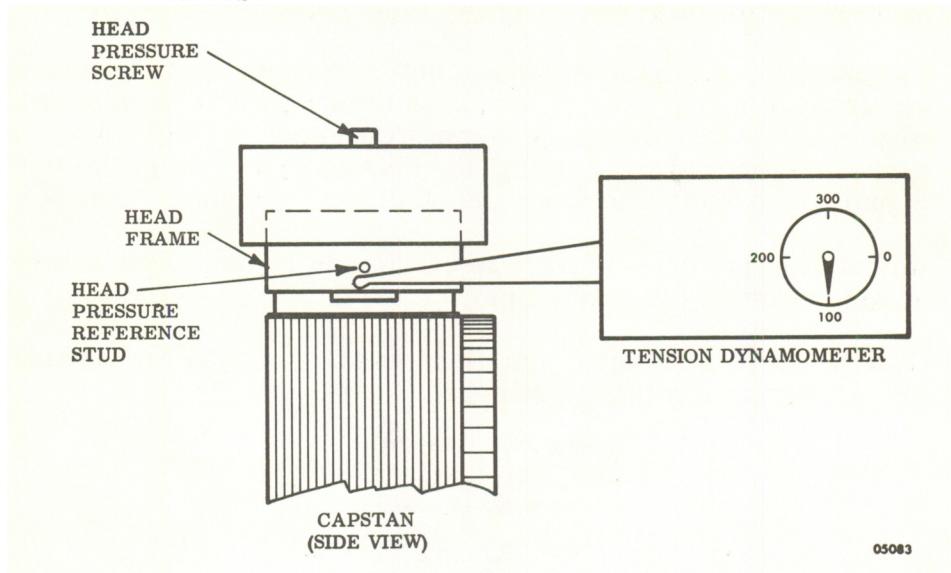


Figure 5.2-4. Head Pressure Measurement

#### 5.2-12 POWER SUPPLY REGULATORS ADJUSTMENTS

5.2-13 There are five power supply voltage regulators located in the system control bay. (See Figure 5.2-5.) Four of the five are mounted on two printed circuit cards located in the card rack. One card contains the -27 vdc and -12 vdc regulators, while the other card comprises the +10 vdc and +12 vdc regulators. The +24 vdc regulator is located in the primary +24 vdc power supply within the system control bay. Adjust the +24 vdc power supply regulator first since power to the other regulators is supplied from this source. Initial alignment is accomplished with the SYSTEM POWER circuit breaker ON and TRANSPORT POWER OFF.

5.2-14 To adjust the +24 vdc regulator use the following procedure:

- a. Locate hole in cover of +24 vdc supply. R6, on the +24 vdc regulator card, is located below this hole.
- b. Connect a digital voltmeter between +24 vdc test jack on inner control panel and ground.
- c. Adjust R6 for a reading of +25 ( $\pm 0.5$ ) vdc.

**NOTE**

After initial adjustment of the voltage regulators (paragraphs 5.2-14 through 5.2-18) is completed with the transport power off, a final adjustment of the +24 vdc regulator must be made with the transport pulling tape.

- 5.2-15 To adjust the -27 vdc regulator perform the following procedure:
- a. Connect the digital voltmeter between TP1 of the dual card and ground on the inner panel.
  - b. Adjust R11 for a reading of -27 ( $\pm 0.5$ ) vdc.
- 5.2-16 To adjust the -12 vdc regulator proceed as follows:
- a. Connect the digital voltmeter between TP2 of the dual card or -12v test point and ground on the inner control panel (see Figure 3.1-2).
  - b. Adjust R22 for a reading of -12 ( $\pm 0.1$ ) vdc.
- 5.2-17 To adjust the +10 vdc regulator perform the following steps:
- a. Connect the digital voltmeter between TP2 of the dual card and ground on the inner panel.
  - b. Adjust R24 for a reading of +10 ( $\pm 0.1$ ) vdc.
- 5.2-18 To adjust the +12 vdc regulator proceed as follows:
- a. Connect voltmeter between TP1 of the dual card or +12v test point and ground on the inner control panel (see Figure 3.1-2).
  - b. Adjust R12 for a reading of +12 ( $\pm 0.1$ ) vdc.

**NOTE**

Balance between the -12 vdc (paragraph 5.2-16) and +12 vdc (paragraph 5.2-18) regulators is important. An acceptable adjustment of the + and -12 vdc can be accomplished by connecting a 10K, 1% resistor to the output of the -12 vdc regulator and another 10K, 1% resistor to the output of the +12 vdc regulator. The junction of these resistors is connected through the voltmeter to the common ground. The regulators are properly balanced when a reversal of the voltmeter leads produces no deflection of the meter on the most sensitive scale.

## 5.2-19 REEL SERVO ALIGNMENT

## NOTE

Before commencing with the following procedures, perform the power supply regulator adjustments described in paragraph 5.2-12.

- a. Remove power from the system.
- b. Remove the lower and upper reel motor wires (blue) from the first slot, on the left hand side, of terminal boards TB3 and TB4, respectively. See Figure 5.2-1 for location of the terminal boards.
- c. Remove the upper reel servo card from J123, in the system control bay. (See Figure 5.2-5.) Insert the upper reel servo card into the extender card and plug the extender card into J123. Ensure that a jumper is placed between J1 and J2.
- d. Connect the vtvm positive lead to pin W of the extender card, and the negative lead to the chassis.
- e. Apply power to the system and set the vtvm polarity switch to minus (-).

## NOTE

For lower reel servo alignment, set the vtvm polarity switch to plus (+).

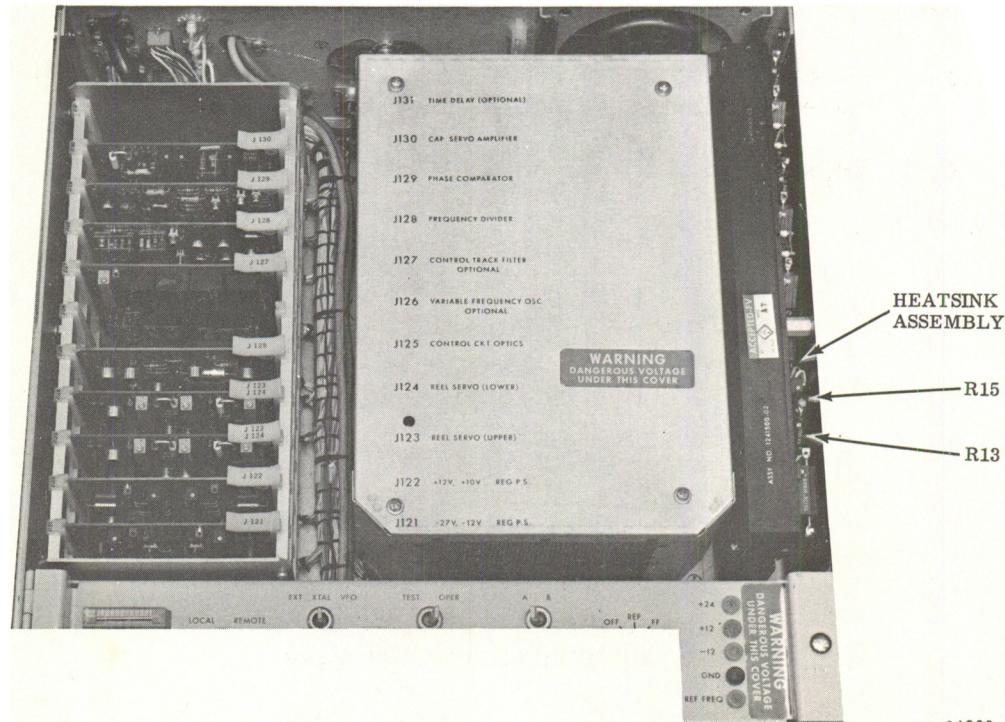


Figure 5.2-5. System Control Bay

- f. Manually rotate the upper reel in a clockwise direction so that the tape will be pulled firmly against the plenum. Note the reading on the vtvm.
- g. Set the vtvm polarity switch to plus (+).

NOTE

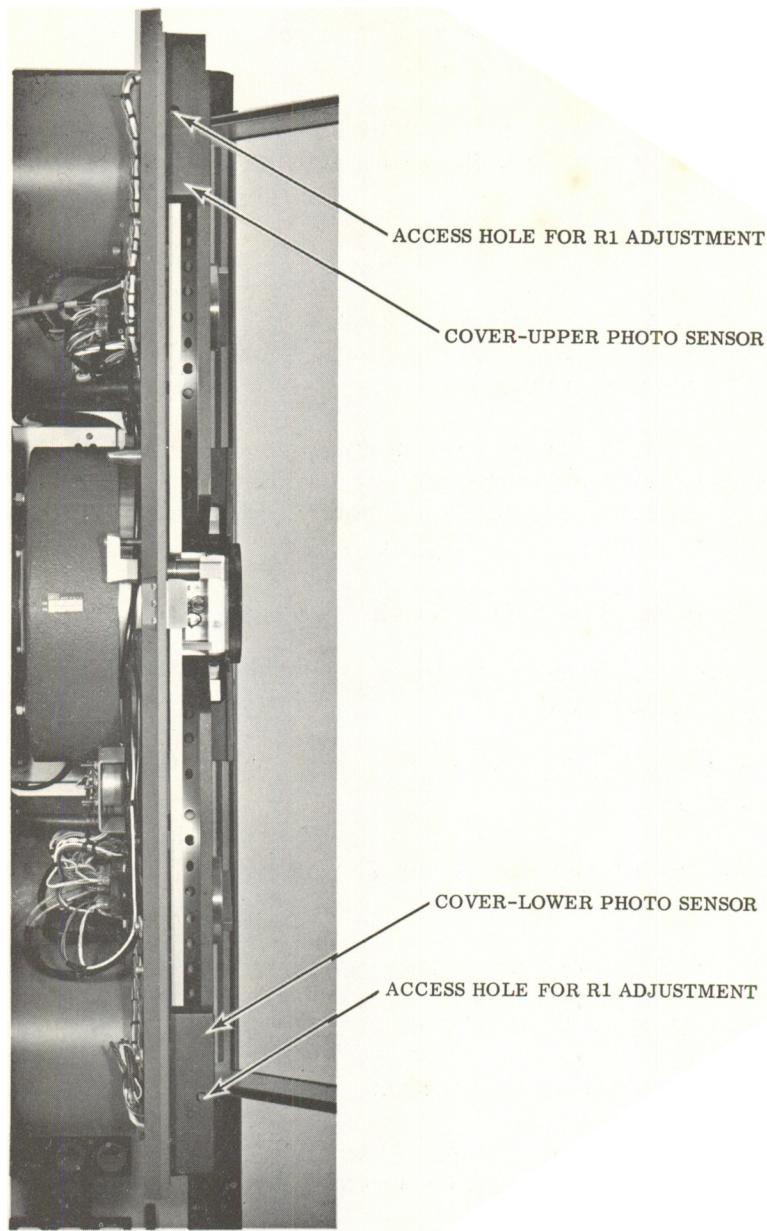
For lower reel servo alignment, set the vtvm polarity switch to minus (-).

- h. Rotate the upper reel counterclockwise so that the tape loop will be located at the outside edge of the plenum assembly. Note the reading on the vtvm.

NOTE

The vtvm readings of steps f and h must be equal in magnitude to within 0.1 volt but opposite in polarity.

- i. If the readings of steps f and h do not fall within the stated tolerance, adjust R1 of the photo-sensor for the correct vtvm reading. Adjustment of R1 is achieved through an access hole on the outside edge of the photosensor cover. See Figure 5.2-6.
- j. Remove power from the system.
- k. Move the vtvm connection from pin W of the extender card to pin P of the extender card.
- l. Rotate R26 full CCW, R6 full CW, and set R21 at mid range (ten turns from either end).
- m. Remove the jumper wire from J3 and connect J4 to the chassis (ground) with a jumper cable.
- n. Apply power to the system and set the vtvm polarity switch to plus.
- o. Adjust R28 for 0.9 ( $\pm 0.1$ ) volt.
- p. Remove power from the system.
- q. Disconnect the jumper cable from the jumper wire and return the jumper wire to J3. Remove the test equipment.
- r. Repeat the above procedure for the lower reel servo card (J124).
- s. Reconnect the lower and upper reel motor wires (blue) which were disconnected in step b.



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**Figure 5.2-6. Reel Servo Photo Sensor Adjustment Point  
(Upper Reel Shown)**

- t. Apply power to system and pull tape at 3-3/4 ips. If there are any oscillations in the reel servo which could show up as brake chatter or tape oscillation in the chamber, rotate R21 CCW (decreasing the servo gain). Repeat, pulling tape in the opposite direction.

#### 5.2-20 CAPSTAN SERVO ALIGNMENT

The procedures for capstan servo alignment are divided into three parts: capstan static torque check, capstan servo compensation and brake amplifier card alignment, and final adjustments during capstan run. Before starting the alignment procedures, perform the power supply regulator adjustments described in paragraph 5.2-12.

#### 5.2-21 CAPSTAN STATIC TORQUE CHECK

The procedure for adjusting the capstan static torque is as follows:

- a. Remove power from the system and remove the capstan compensation and brake amplifier card from J130 of the system control bay. (See Figure 5.2-5.)
- b. Insert the extender card into J130 and ground pin Y of the extender card to the chassis.
- c. Rotate R15, on the heat sink assembly, fully counterclockwise. Then connect the vtvM across R13, on the heat sink assembly with the negative probe to the ground side. See Figure 5.2-5 for location of R15 and R13 on the heat sink.
- d. Place the system in standby mode.
- e. Wrap a three foot length of string twice around the capstan. Tie the free end of the string over the hook of the spring scale and gently pull on the scale. See Figure 5.2-7. Reading on scale should be 10 to 15 inch-ounces during movement of the capstan. (Five to 7-1/2 ounces at radius of capstan.)

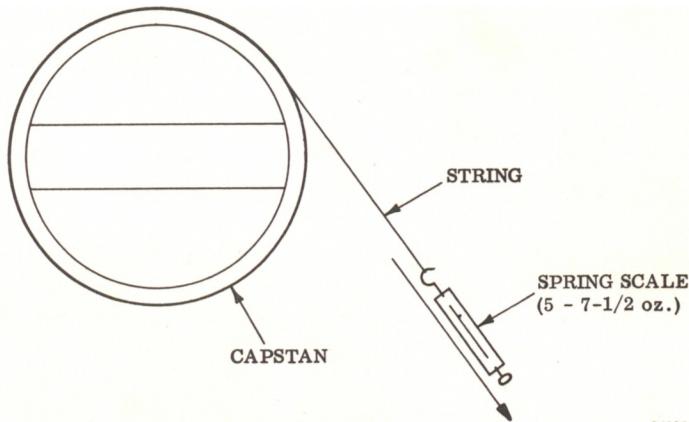


Figure 5.2-7. Capstan Static Torque Check

- f. If the scale reading is incorrect, rotate R15, on the heat sink, in the clockwise direction until correct scale reading appears. The vtvm reading across R13 shall read less than 5.0 vdc (500 ma holding current).
- g. Remove power from the system and then remove the test equipment.

#### 5.2-22 CAPSTAN SERVO COMPENSATION AND BRAKE AMPLIFIER CARD ALIGNMENT

The procedure for aligning the capstan servo compensation and brake amplifier card is as follows:

- a. Remove power from the system.
- b. Rotate R21 on the capstan servo compensation and brake amplifier card, fully counterclockwise, then back off approximately seven turns clockwise.
- c. Insert the capstan servo compensation and brake amplifier card into the extender card and plug the extender card into J130 of the control bay. Ensure that the jumper is in place between TP1 and TP2 on the capstan servo compensation and brake amplifier card.
- d. Connect the positive lead of the vtvm to pin W of the extender board, and the negative lead to the chassis.
- e. Put the system in standby mode and connect a jumper cable between test point E2 on the capstan servo compensation and brake amplifier card, and pin D of the extender card.
- f. Rotate R22, on the capstan servo compensation and brake amplifier card, clockwise until the vtvm reads 2.0 ( $\pm 0.1$ ) vdc.
- g. Remove the jumper cable from pin D and connect to the chassis.
- h. Rotate R23, on the capstan servo compensation and brake amplifier card, until the vtvm reads 0.7 ( $\pm 0.1$ ) vdc.
- i. Remove power from the system and remove the test equipment. The extender card and the capstan servo compensation and brake amplifier card shall remain intact.

#### 5.2-23 FINAL ADJUSTMENTS DURING CAPSTAN RUN

The final adjustments on the capstan servo are as follows:

- a. Set overshoot timing (R10), on the capstan servo compensation and brake amplifier card, fully clockwise.
- b. Apply power to the system and place the TAPE SPEED selector switch on the control bay front panel in the 3-3/4 ips position. Place recorder/reproducer in a forward mode of operation.

- c. If the TACH lamp does not light steadily, rotate R21 on the capstan servo compensation and brake amplifier card until the lamp does light steadily. If the TACH lamp illuminates continuously, after tape movement has begun, adjustment of R21 is not necessary.
- d. Connect the vtvm positive lead to test point E1 on the capstan servo compensation and brake amplifier card, and the negative lead to the chassis.
- e. Rotate R23 on the capstan servo compensation and brake amplifier card for 0.0 ( $\pm 0.5$ ) vdc reading on the vtvm.

**CAUTION**

THE RIGHT-HAND LEAD OF L3 IS NOT USED FOR A TEST POINT BECAUSE OF ITS PROXIMITY TO OTHER ELECTRONICS CIRCUITS. AN INADVERTENT SHORT BY THE SCOPE PROBE, WHILE POWER IS ON, WOULD CAUSE SERIOUS DAMAGE TO THE PHASE COMPARATOR CIRCUITRY.

- f. Carefully connect the oscilloscope probe to the left-hand lead on L3, which is located at the top center of the phase comparator card.
- g. Set the TAPE SPEED selector switch (S18) to 120 ips.
- h. Set the oscilloscope sweep speed to 2  $\mu$ sec/cm. Synchronize on the leading edge of the positive going signal (+ sync). Display a single waveform on the screen similar to Figure 5.2-8. The trailing edge contains an error signal which represents servo action and, in turn, time base error.
- i. Rotate R21 clockwise, lowering the gain until the TACH SYNC light goes out. At this time, the signal will disappear from the scope and the transport will be running overspeed.
- j. Slowly turn R21 counterclockwise (increasing gain) until synchronism is achieved and the TACH SYNC light remains on.
- k. Continue to turn R21 slowly counterclockwise until minimum time-base error is observed at the trailing edge of the scope pattern. Expand the scope sweep to get a clearer picture of the error signal, if necessary. Adjustment of R21 in either direction from this point will increase time base error.
- l. Set the TAPE SPEED selector switch to 1-7/8 ips. Adjust R21 for least time-base error. Set TAPE SPEED selector switch to 120 ips. Recheck time-base error.

## NOTE

If control track is used, perform the following steps for tape mode operation.

- m. Install control track cables as described in paragraph 2.2-7.
- n. Perform the adjustments in paragraph 5.2-27, steps a through e.
- o. Record a section of tape.
- p. Rewind the tape to the beginning of the recording.
- q. Place the recorder/reproducer in the forward reproduce mode of operation.
- r. Rotate R17 on the capstan servo compensation and brake amplifier card for best TBE display on oscilloscope screen at high and low speeds.

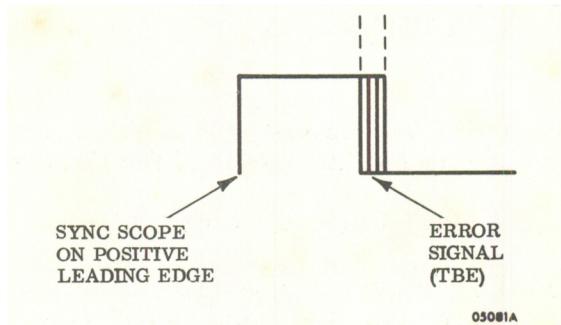


Figure 5.2-8. Typical Time Base Error (TBE)

#### 5.2-24 CAPSTAN PHOTOSENSOR AND TACHOMETER PREAMPLIFIER ALIGNMENT

The procedures described below are the only adjustments which should be attempted within the capstan assembly. The capstan bell housing has an access plate, which, when removed, exposes the capstan photosensor and tachometer preamplifier assemblies.

- a. Turn system power off.
- b. Thread tape for a forward mode of operation.
- c. Remove access plate from capstan bell housing.
- d. Loosen the two Phillips-head screws that secure the photosensor unit on the tachometer preamp assembly.
- e. Connect the oscilloscope to TB3 pin 18 (tachometer preamplifier output) and chassis ground.

- f. Adjust the oscilloscope scale for a 10v peak-to-peak reading.
- g. Turn system power on, transport power on and depress FORWARD mode pushbutton.
- h. Position the photosensor unit by hand until maximum output voltage is read on the scope. (Minimum of 3v peak-to-peak.)
- i. When the maximum voltage is reached, hold the photosensor unit in position. Turn system power off and tighten the Phillips holddown screws.
- j. Turn system power on and rotate capstan manually, then measure the output voltage of the preamplifier to insure that alignment of the photosensor unit is correct after the Phillips holddown screws have been tightened.
- k. Turn system power off.
- l. Disconnect test instruments.
- m. Replace the access plate.

#### 5.2-25 END-OF-REEL PHOTOSENSOR ALIGNMENT

The end-of-reel photosensors are adjusted on an imaginary line described by the measurements shown in Figure 5.2-9. This setting will actuate the end-of-reel photosensor when there is 1/4-inch of tape remaining on the supply reel. The end-of-reel photosensor should be adjusted before the sequential photosensor adjustments are made.

- a. Determine direction of operation (forward or reverse) and thread the tape accordingly. (Refer to paragraph 3.2-5.)

#### NOTE

For discussion purposes, forward direction will be assumed.

- b. Set the TAPE SPEED selector switch to 15 ips.
- c. Apply power to the system and depress the TRANSPORT POWER ON pushbutton.
- d. Loosen the adjustment screw that holds the upper end-of-reel and sequential photosensor assemblies to the transport base plate. Move upper end-of-reel photosensor laterally to the right as far as it will go.
- e. Depress the FORWARD pushbutton and wind the tape on the lower reel until 1/4-inch of tape remains on the upper reel.
- f. Depress the STOP pushbutton.

- g. Depress the FORWARD pushbutton and move the end-of-reel to the left until the recorder stops and the FAULT lamp lights.

**NOTE**

Moving the end-of-reel photosensor further to the left will activate the end-of-reel response earlier.

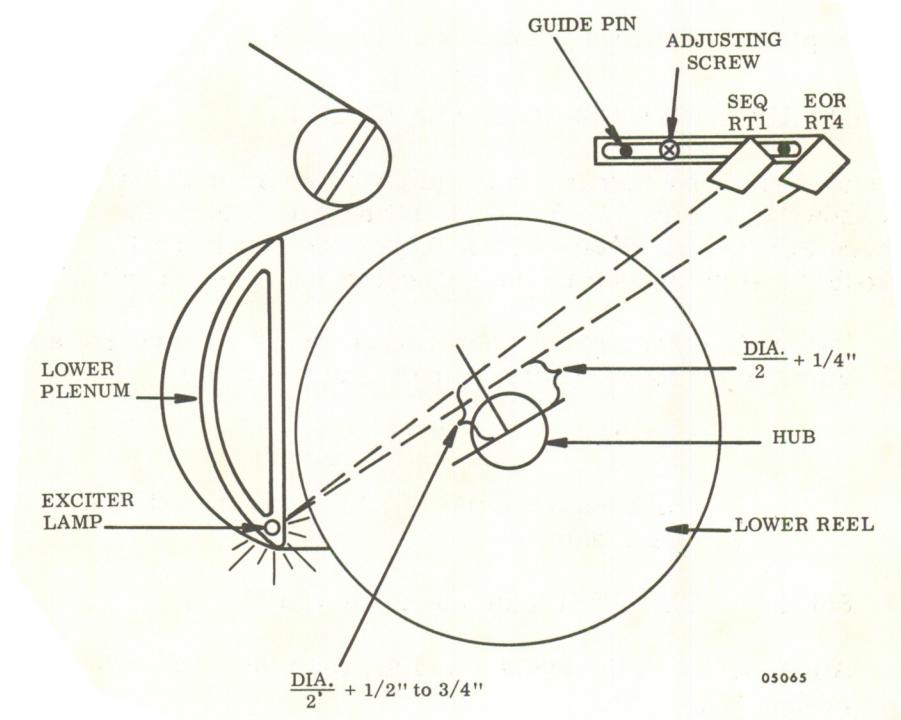


Figure 5.2-9. End-of-Reel and Sequential Photosensor Alignment

- h. Tighten the adjusting screw.
- i. Adjust the lower end-of-reel photosensor using the same procedures except that the tape must be threaded for reverse operation.

#### 5.2-26 SEQUENTIAL PHOTOSENSOR ALIGNMENT

The sequential photosensors are adjusted on an imaginary line described by the measurements shown in Figure 5.2-9. This setting will actuate the sequential photosensors when the tape remaining on the supply reel has been reduced to a predetermined amount. Adjustment of sequential timing before end-of-reel shut down is left to the discretion of the user.

- a. Determine direction of operation (forward or reverse) and thread tape accordingly on the recorder being adjusted and on the recorder next in sequence. (Refer to paragraph 3.2-5.)

##### NOTE

For discussion purposes forward direction will be assumed.

- b. Set TAPE SPEED selector switch to 15 ips on both recorders.
- c. Apply power to the recorders and depress TRANSPORT POWER ON pushbutton of both recorders.
- d. Place the SEQUENTIAL switch in FWD (forward) position on both recorders.
- e. On the initial recorder, loosen the adjustment screw that holds the upper end-of-reel and sequential photosensor assemblies to the transport base plate. Move the upper sequential photosensor laterally to the right as far as it will go.
- f. On the initial recorder, depress the FORWARD pushbutton and wind the tape on the lower reel until a sufficient amount of tape remains on the upper reel to provide a safe margin of recording overlap.

##### NOTE

High-speed operation requires a larger reserve of tape on the upper reel than low speeds.

- g. Depress the STOP pushbutton.
- h. Depress the FORWARD and both record pushbuttons of the initial recorder, and move the sequential photosensor to the left until the second recorder goes into record mode.

**NOTE**

Moving the sequential photosensor further to the left will actuate the sequential action sooner.

- i. Tighten the adjusting screw.
- j. Place both recorders in stop mode.
- k. Adjust the lower sequential photosensor using the same procedures except that tape threading and the setting of the SEQUENTIAL switch will be for reverse operation.
- l. Adjust the second recorder in the same manner.

**NOTE**

It is imperative that, if either photosensor assembly (end-of-reel or sequential) is adjusted, the other be checked for alignment since the adjustment screw holds both assemblies in place.

**5.2-27 CONTROL TRACK FILTER LEVEL ADJUSTMENT**

The control track filter level adjustment procedures are performed at one tape speed only. The output level must be checked whenever the recording speed is changed. It is necessary that one channel of data signal is aligned. For alignment procedures, consult ES-100 Signal Electronics Operation and Maintenance manual (Number 69650).

- a. Thread tape for a forward mode of operation.
- b. Connect an ac-vtvm to the output of the reproduce amplifier of the selected channel.
- c. Select a tape speed normally used when recording.
- d. Turn the system power on, depress TRANSPORT POWER ON, FORWARD and both RECORD pushbuttons.
- e. Adjust R4 on the control track filter card for a reading of 1v (rms).
- f. Depress STOP button.
- g. Place SYSTEM POWER to OFF position. Remove test equipment.

**5.2-28 DISASSEMBLY AND REPAIR****5.2-29 HEAD ASSEMBLY - REMOVAL AND REPLACEMENT**

5.2-30 The head assembly will be removed or replaced as a unit. The head stacks are mounted on a precision, head mounting plate which is attached to the capstan housing with

three large Allen-head screws. Following head assembly replacement, refer to paragraph 5.2-10 for head pressure measurement.

- a. Turn system power off.
- b. Remove the capstan. (Refer to step a of paragraph 5.1-5.)
- c. Disconnect the head connectors from each head stack.
- d. Remove the cotter pin that holds the head-lifter solenoid to the clevis pin.
- e. Remove the solenoid linkage arm from the clevis pin.
- f. Remove the three large Allen screws that hold the head mounting plate to the capstan housing.
- g. Remove the head assembly, as a unit.

**5.2-31 To replace the head assembly proceed as follows:**

- a. Hold the head assembly firmly against the capstan bearing housing and tighten the three Allen-head mounting plate screws.
- b. Connect the head-lifter solenoid linkage by reversing the procedures performed in steps d and e (paragraph 5.2-30).
- c. Reconnect the head connector plugs.
- d. Perform head-lifter solenoid adjustment (paragraph 5.2-9). Check signal amplitude stability and head pressure (paragraph 5.2-10).

**5.2-32 REPLACEMENT OF AIR COMPRESSOR VANES (GAST PART NUMBER AD979)**

Vanes must be replaced whenever the compressor operates but fails to produce a pressure of 6 psi. New vanes may be ordered from the Gast Manufacturing Corporation, P. O. Box 117, Benton Harbor, Michigan. The parts involved in replacing the vanes are shown in Figure 5.2-10. Proceed as follows:

- a. Remove the mounting screws and remove the compressor from the transport.
- b. Remove the three retainer plate mounting screws, the retainer plate, and the outer carbon end plates.
- c. Remove the vanes to be replaced.
- d. Use compressed air to clean out the pump chamber, particularly if a vane was broken.

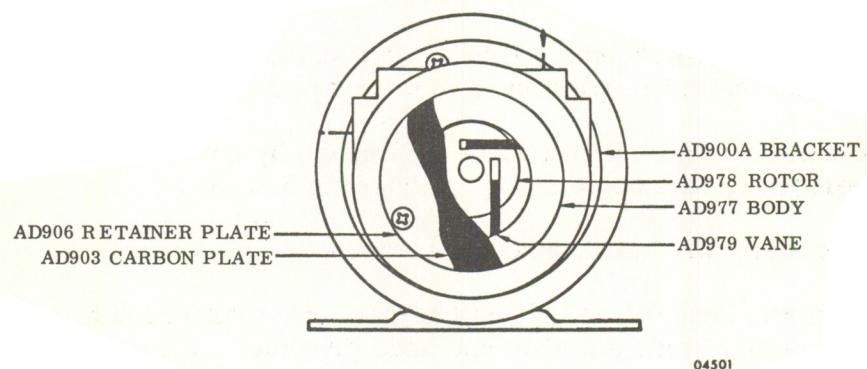
**NOTE**

If the carbon end plates appear to be worn, the compressor should be returned to the Gast Manufacturing Company for repair.

- e. Install new vanes, Gast part number AD979. (See Figure 5.2-10.)
- f. Position the outer carbon end plates and the retainer plates. Replace and tighten the three end-plate mounting screws.

**NOTE**

If the pump fails to produce adequate pressure after replacement of vanes, return the pump assembly to the Gast Manufacturing Company for reconditioning.



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Figure 5.2-10. Compressor Parts Involved in Replacement of Vanes

## **CHAPTER 6**

**SCHEMATICS,  
ASSEMBLIES  
AND LM'S**

## SECTION I

### 6.1-1 INTRODUCTION

6.1-2 This chapter is divided into three sections, Section I INTRODUCTION, Section II SCHEMATIC DIAGRAMS, and Section III ASSEMBLY DRAWINGS AND LISTS OF MATERIALS. The format, purpose, and method of using the material in each section is described in the following paragraphs.

6.1-3 This section (Section I) describes the arrangement of the material in the chapter and the use and relationship of the schematic diagrams, assembly drawings, and the lists of materials (LM's).

6.1-4 As an aid in troubleshooting the equipment, Section II contains all the applicable schematic diagrams, arranged in numerical sequence. When applicable, a note on the schematic will reference it to the appropriate assembly drawing. The section has its own cross-referenced index. The index is in two parts, one that lists the schematic drawings alphabetically and one that lists them in numerical sequence. Each listing is cross-referenced to the appropriate assembly number. Alphabetical listings are in direct reading order (i.e., High Gain Amplifier, not Amplifier, High Gain).

6.1-5 For use in identifying and ordering parts, Section III contains all the necessary assembly drawings and lists of materials for the equipment. The drawings and LM's are arranged in order of top assembly to last subassembly. When applicable, the LM lists the appropriate schematic number. The LM always starts on the first right hand page following the applicable assembly drawing.

6.1-6 The section has a two-part index similar to the one described for the schematics. The first part of the index lists the assembly drawings in alphabetical order, and the second lists them in numerical order. Where applicable, the assembly is cross referenced to the appropriate schematic.

### 6.1-7 USING THE LISTS OF MATERIALS (LM'S)

6.1-8 Each item of a typical LM is explained below. The key number preceding each item corresponds to the same key number on the sample LM, shown in Figure 6.1-1.

- (1) Assembly Title. This is the title assigned the assembly by the Ampex Engineering Department.
- (2) Catalog Number of Assembly. This number corresponds to the number stamped on, or affixed to, the assembly during manufacture.

- (3) Item Number. This number is assigned to parts to aid in identifying and locating the parts on the LM or assembly drawing.
- (4) Ampex Part Number. These are Ampex's document and part control numbers.
- (5) Vendor or Military Number. This is the identification number that Ampex used to purchase the part from a vendor. Any suitable equivalent may be used in the procurement of parts so identified.
- (6) Schematic Reference. This number is assigned to electrical components on the schematic drawings.
- (7) Part Description. This is an abbreviated explanation of each part used in the complete assembly, to assist the user in identifying parts. Where the same part is listed more than one time on an LM, the statement "Same as -----" will be given, and refers to the description given for the first listing of the part.
- (8) Quantity Required Per Version. This number indicates the quantity of each part required in the complete assembly.
- (9) Sheet \_ of \_. This figure indicates the number of pages comprising the complete list of materials for the assembly.
- (10) Date. This area of the page will contain the date that the LM has been changed or revised. Where no changes have occurred, there will be no date given.
- (11) Control Number. This is for Ampex Corporation use only.
- (12) Page Number. This is the page number assigned to each page, as listed in the indexes. In the sample page number 6.3-4, the 6 signifies chapter 6, the .3 signifies the third section of chapter 6, and the -4 indicates the fourth page of section 3.

6.1-9 Figure 6.1-2 illustrates how to find a part number or name by cross-referencing the item key numbers between the LM's and the assembly drawings and schematic diagrams.

CHOPPER OSCILLATOR ASSEMBLY 1				PART DESCRIPTION 7	QUANTITY REQUIRED PER VERSION						
ITEM NO.	AMPEX PART NO. 4	VENDOR OR MIL. NO. 5	SCHEMATIC REFERENCE 6		-01						
2	1208395-10			PRINTED WIRING BOARD ASSEMBLY	1	8					
3	1202583-10			SCREW, Module	2						
4	1202584-40			PANEL, Housing	1						
6	6000022-10			LABEL, Identification	1						
8	087-061			GREASE, #7 silicon	A/R						
9	014-990	2N1540	Q7, 8	TRANSISTOR	2						
10	150-142			SOCKET, Transistor Mounting	2						
11	430-075			RING, Retain:	2						
12	471-063			SCREW, P 4-40 x 7/16	4						
13	471-061			SCREW 4-40 x 5/16	4						
14	471-068			SCR' ps, 6-32 x 5/16	4						
16	496-004		N		8						
18	501-096			.6 ID	2						
19	502-003			g, Lock #6	4						
20	503-019			at, phenolic #6	4						
22	1208396			.IC	REF						

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1800276

10

6.3-4

11

12

Figure 6.1-1 Example of List of Materials

## LIST OF MATERIALS

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	CATALOG NO. 1800276		Sheet 1 of 2	
					-01			
2	1208395-10		PWB1	PRINTED WIRING BOARD ASSEMBLY	1			
3	1202583-10			SCREW, Module	2			
4	1202584-40			PANEL, Housing	1			
6	6060022-10			LABEL, Identification	1			
8	087-061			GREASE, #7 silicon	A/R			
9	014-090	2N1540	Q7, 8	TRANSISTOR	2			
10	130-142			SOCKET, Transistor Mounting	2			
11	430-075			RING, R				
12	471-063			SCREW,				
13	471-061			SCREW,				

**SCHEMATIC**

**ASSEMBLY DRAWING**

Figure 6.1-2 Using the List of Materials

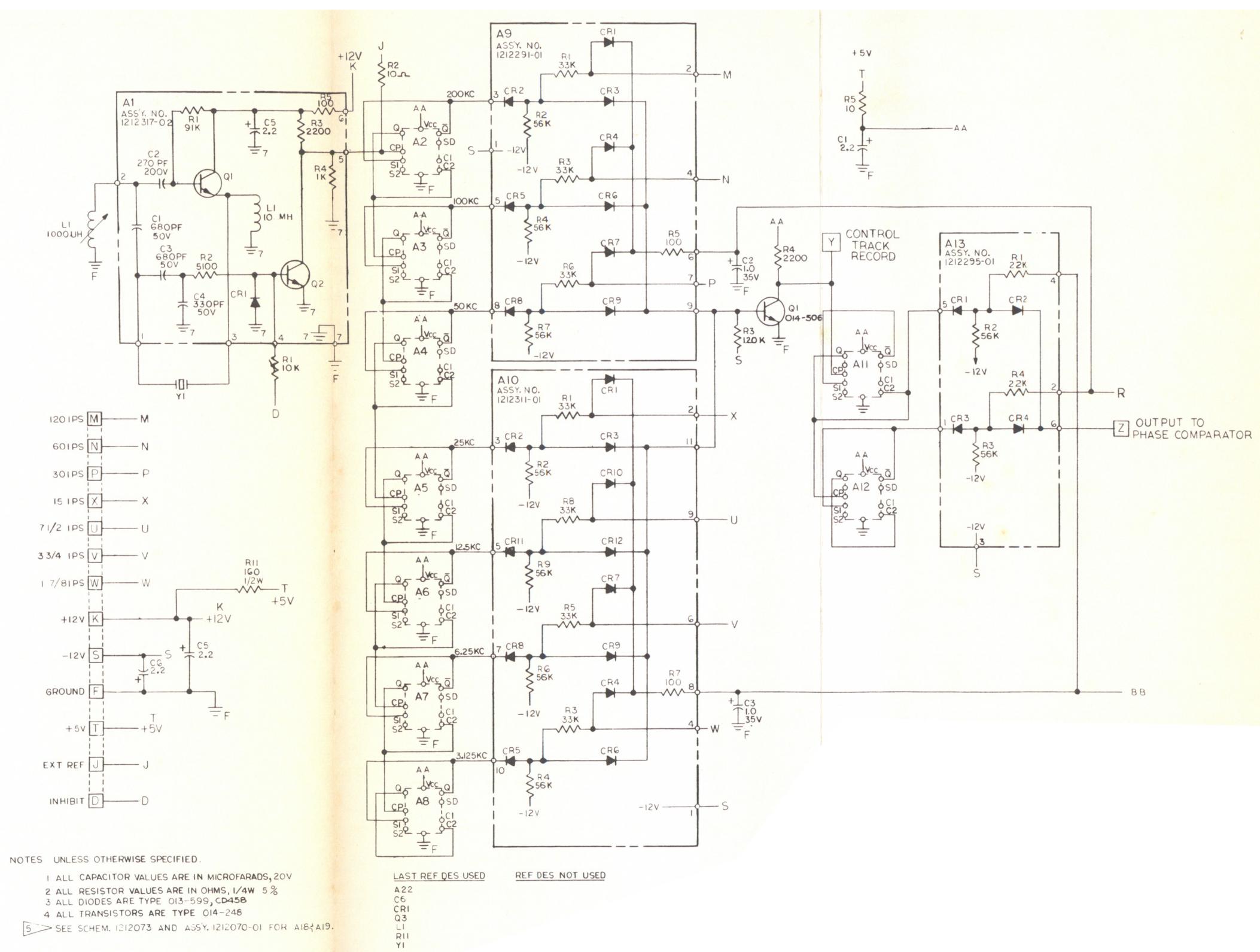
## **SCHEMATICS (INDEX)**

## ALPHABETICAL INDEX FOR SCHEMATICS

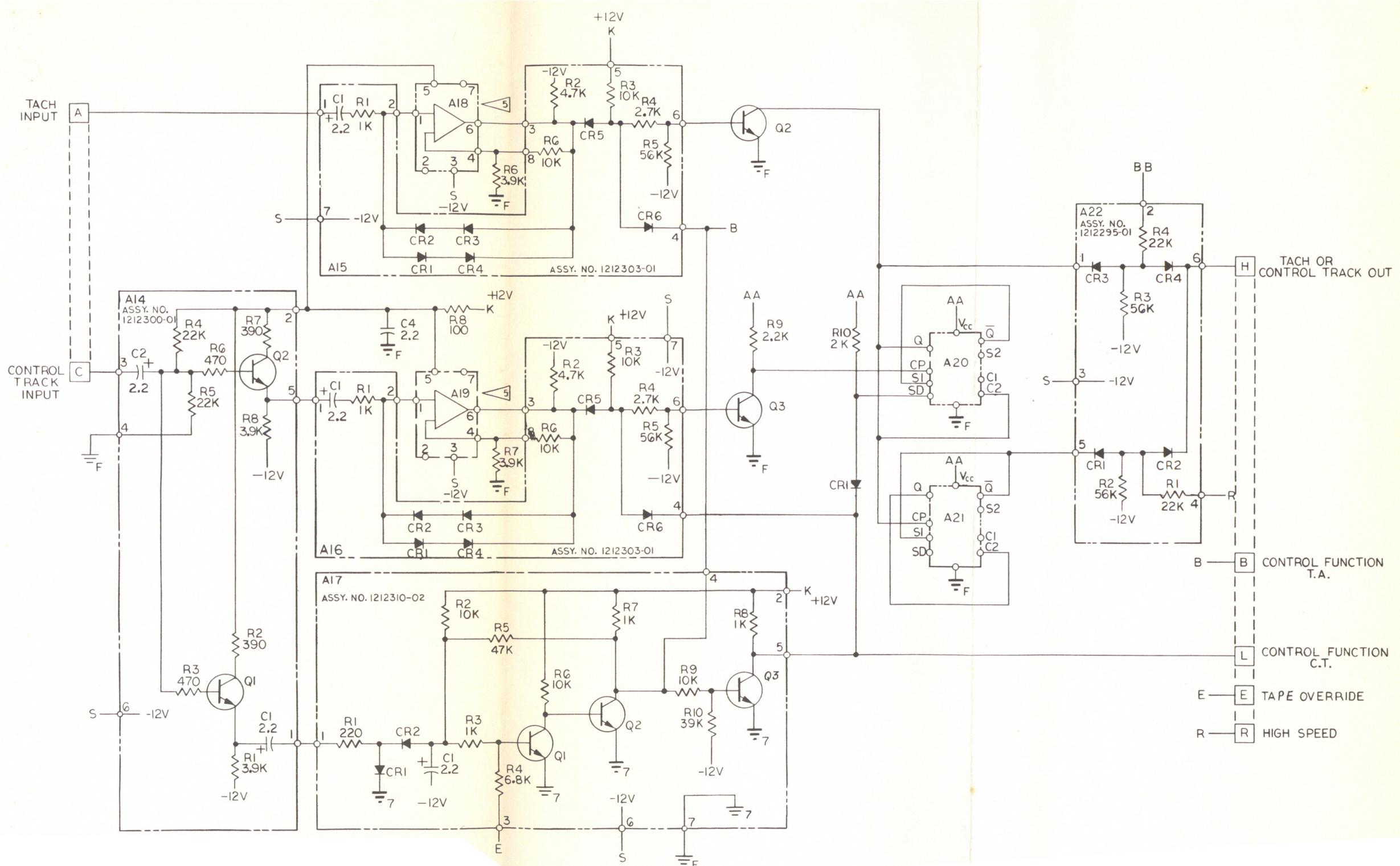
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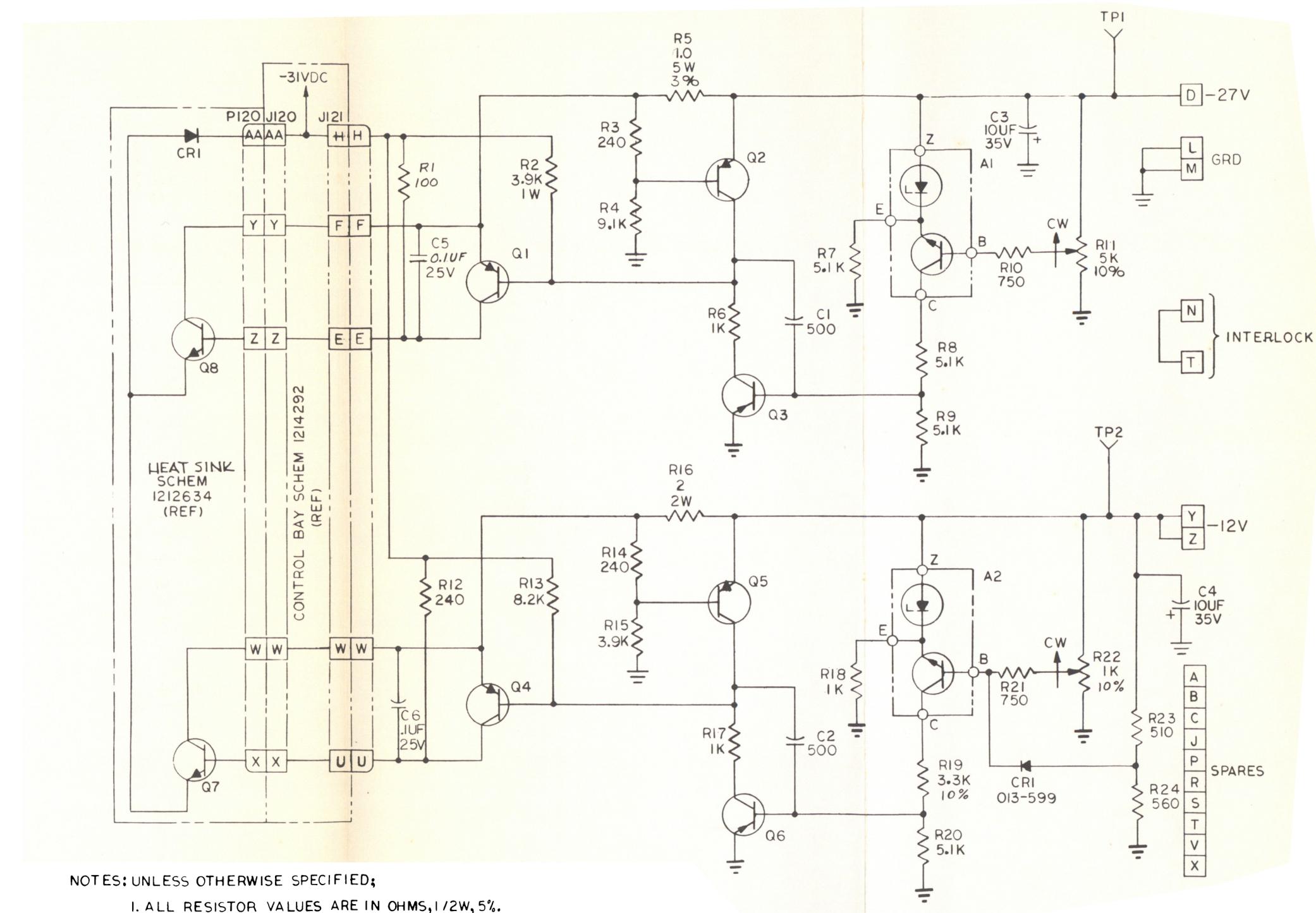
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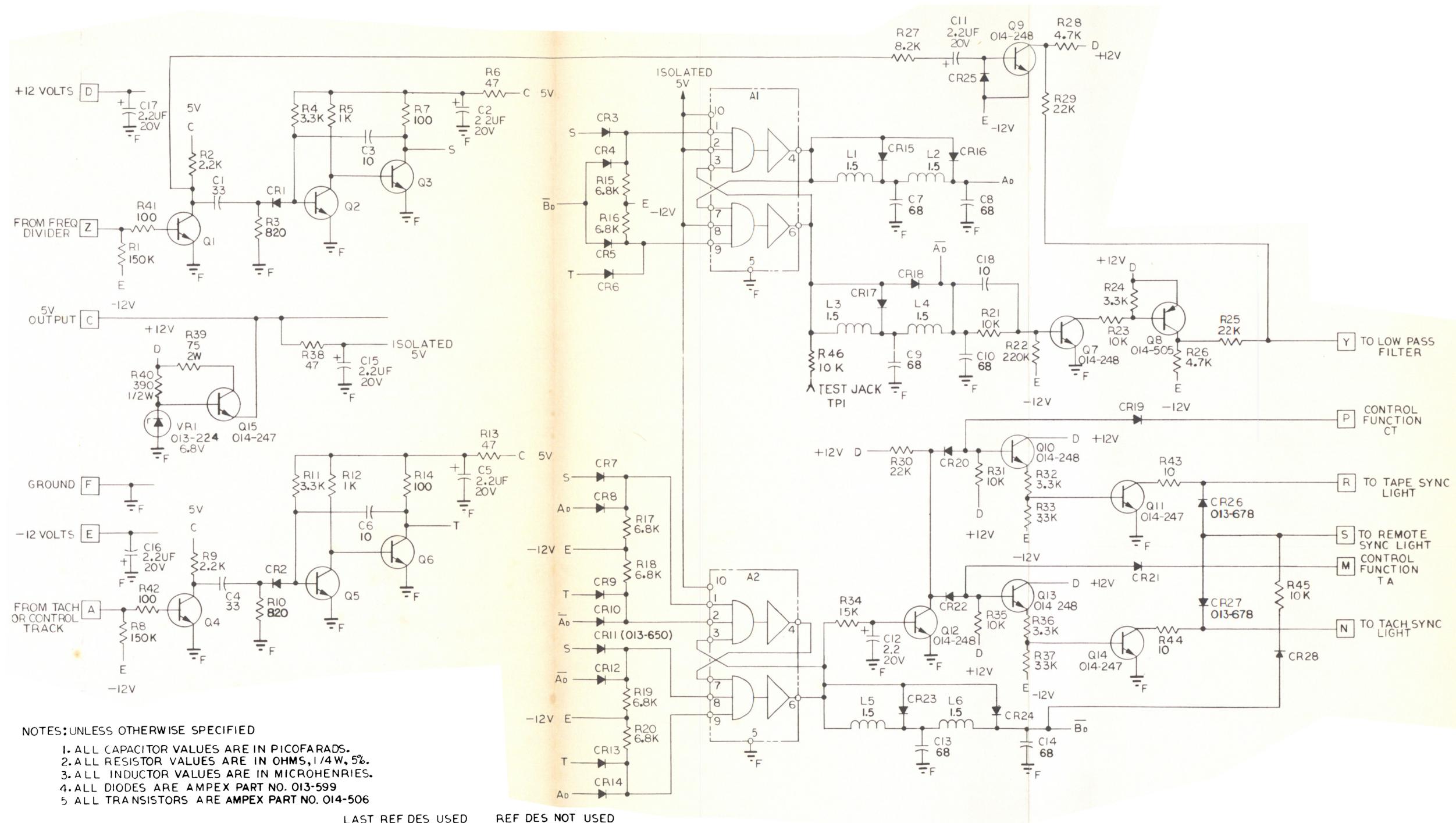
Frequency Divider Schematic  
Dwg. No. 1212287D  
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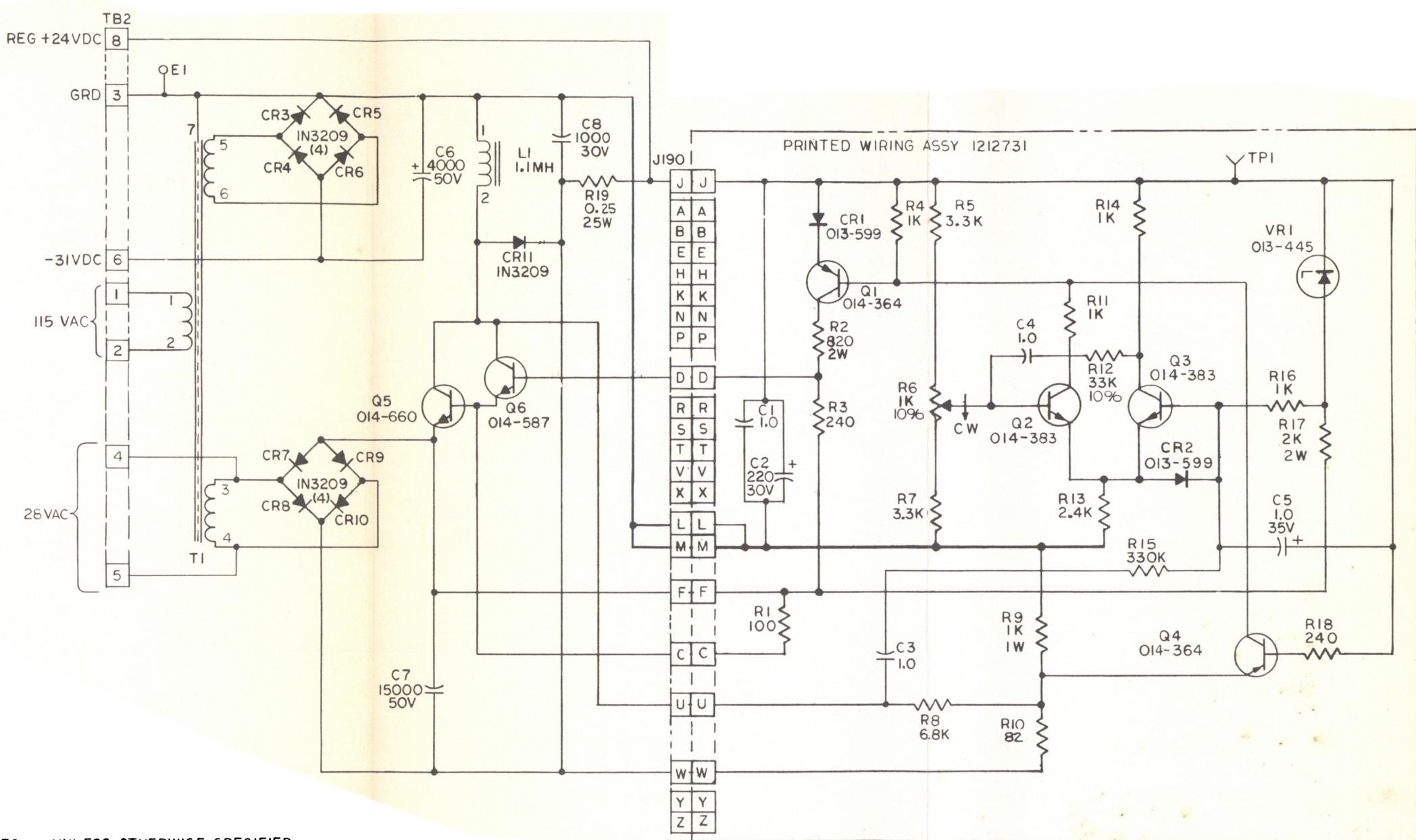
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Regulated Power Supply (-12V, -27V) Schematic  
Dwg. No. 1212593F

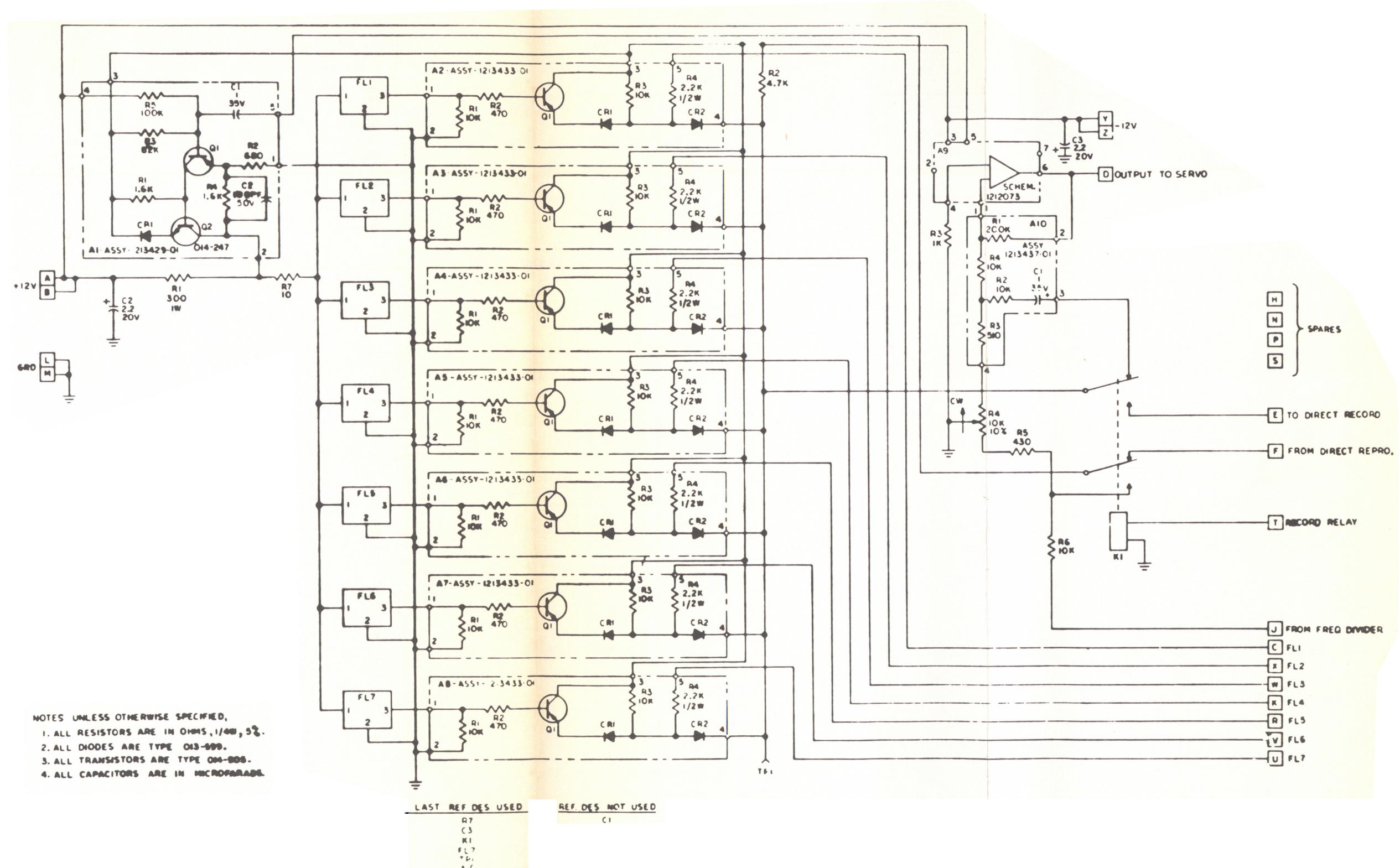


Phase Comparator Schematic  
Dwg. No. 1212595E

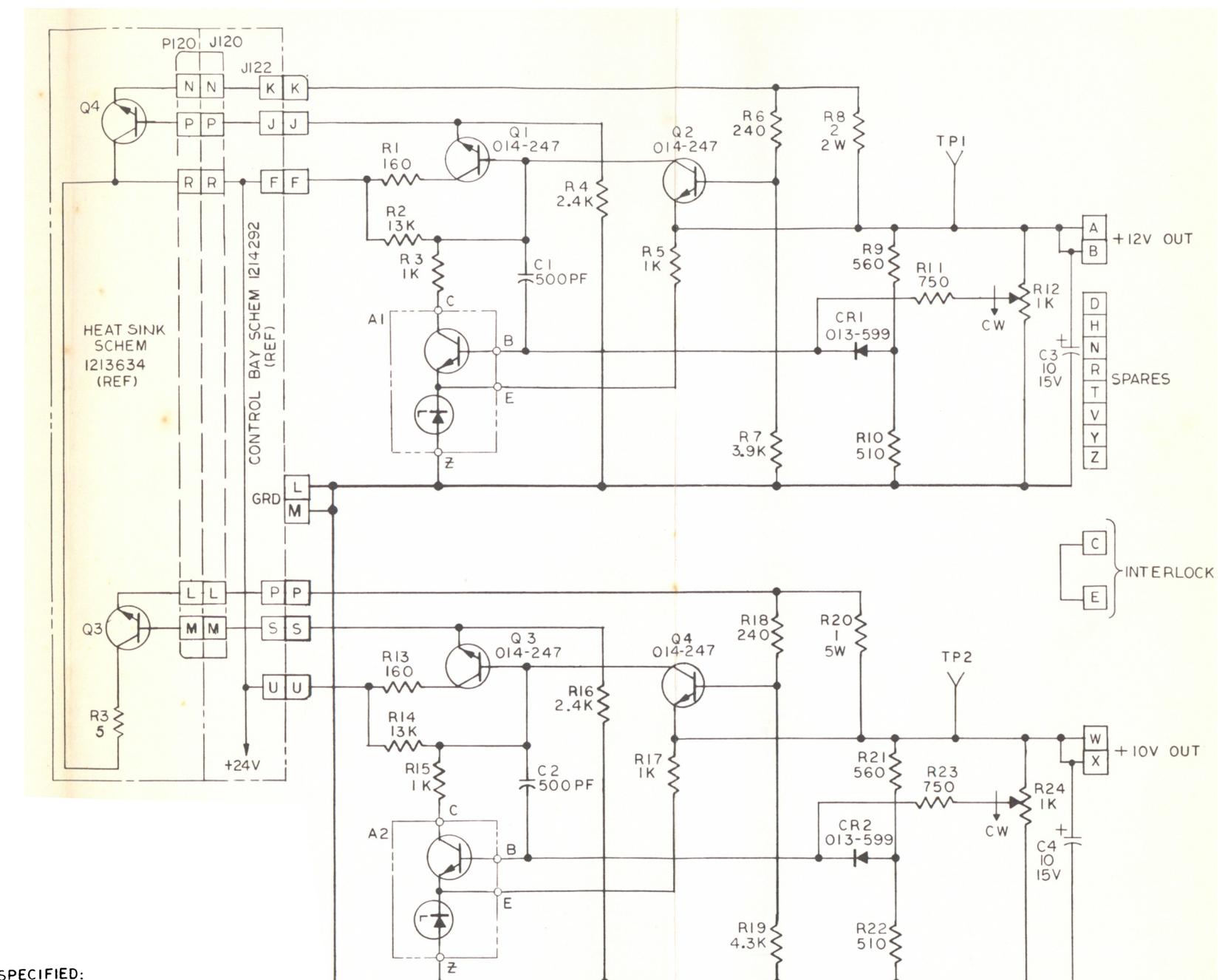


LAST REF. DES. USED	REF. DES. NOT USED
R19	TB1
C8	
CR11	
Q6	
VRI	
TPI	
EI	
TB2	

Regulated Power Supply (+24 Volt) Schematic  
 Dwg. No. 1212728J

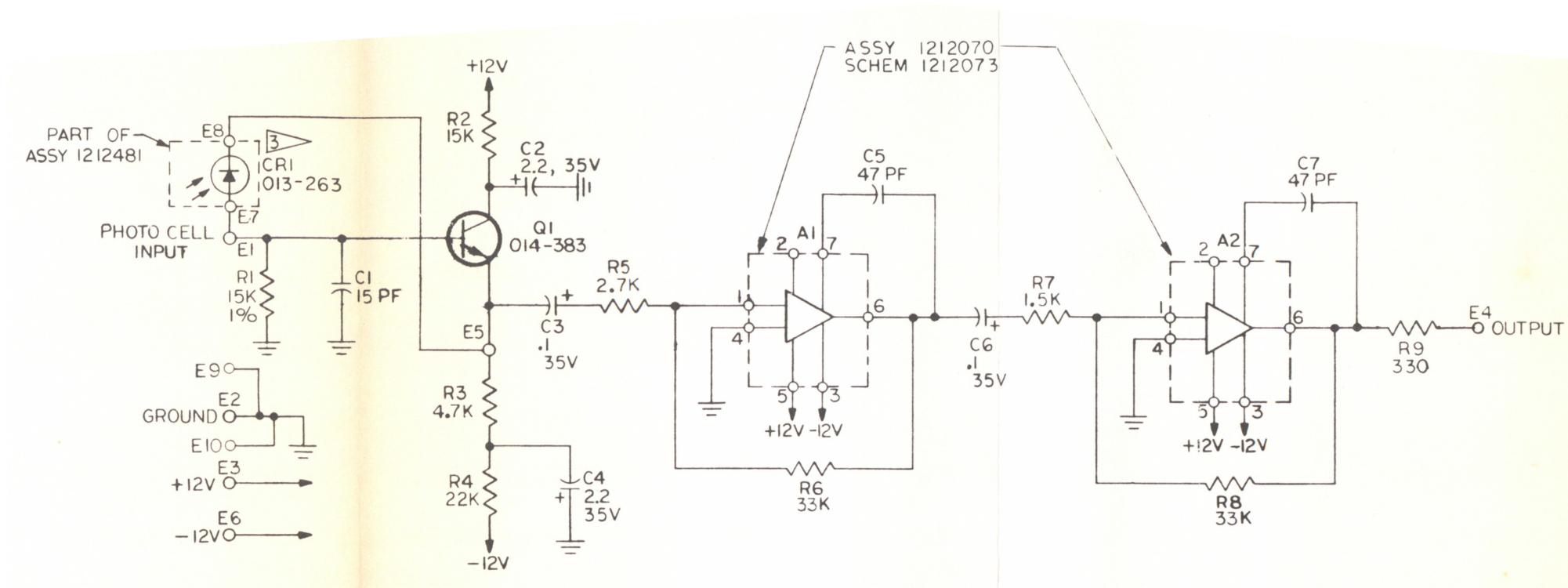


Control Track Filters Schematic  
Dwg. No. 1212791C



REF. DES. NOT USED	LAST REF. DES. USED
Q4	
TP2	
C4	
A2	
R24	
CR2	

Regulated Power Supply (+10V, +12V) Schematic  
Dwg. No. 1212876A



NOTES: UNLESS OTHERWISE SPECIFIED.

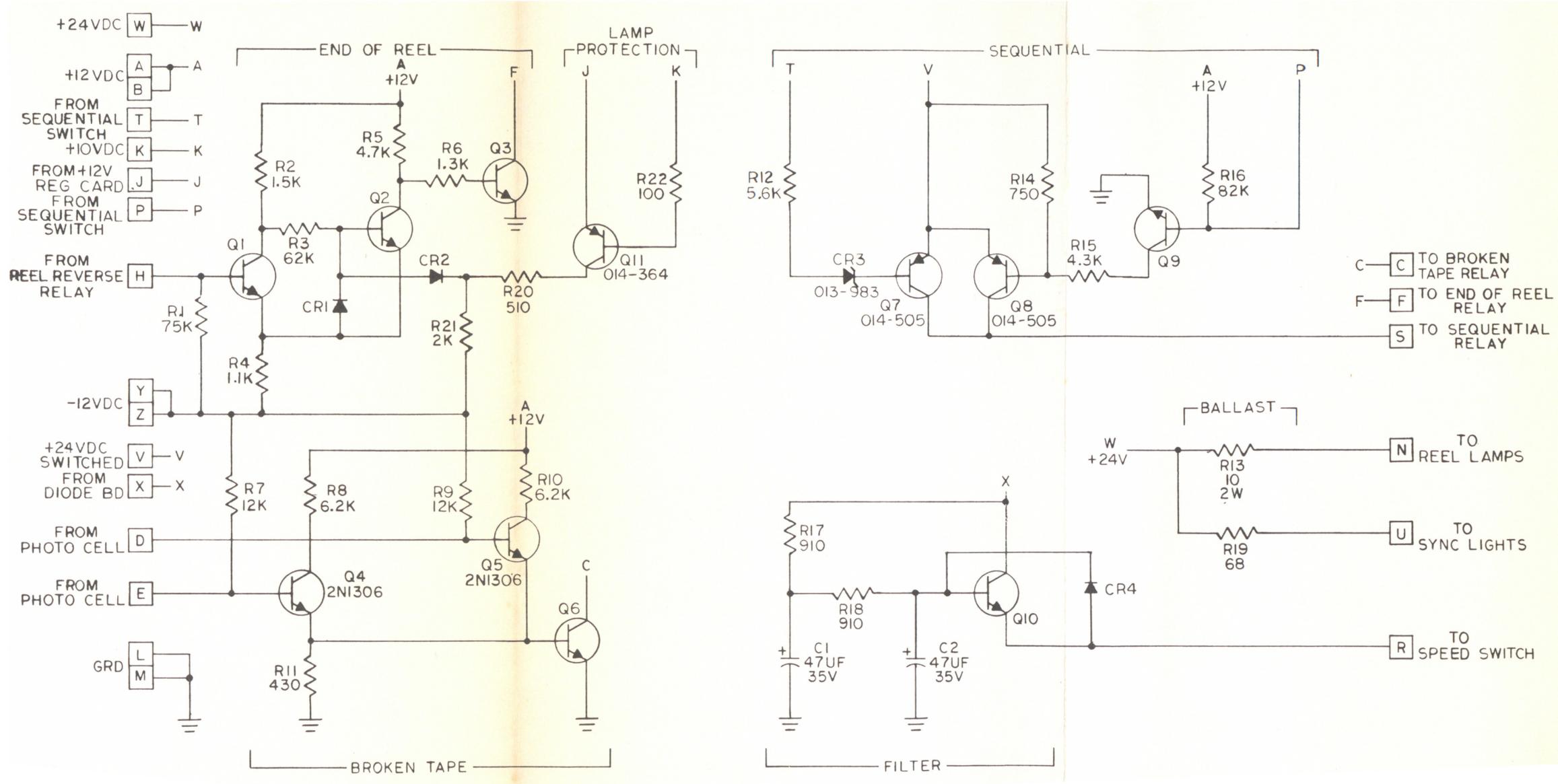
1. ALL CAPACITOR VALUES ARE IN MICROFARADS, 500V, 5%.
2. ALL RESISTOR VALUES ARE IN OHMS 1/4W, 5%.
- 3> PHOTO CELL POLARIZED WITH RED DOT LEAD TO E8, OTHER LEAD TO E7.

LAST REF DES NO. USED

A2  
C7  
E6  
Q1  
R9  
CRI

REF DES NO. NOT USED

Tachometer Preamplifier Schematic  
Dwg. No. 1212902A



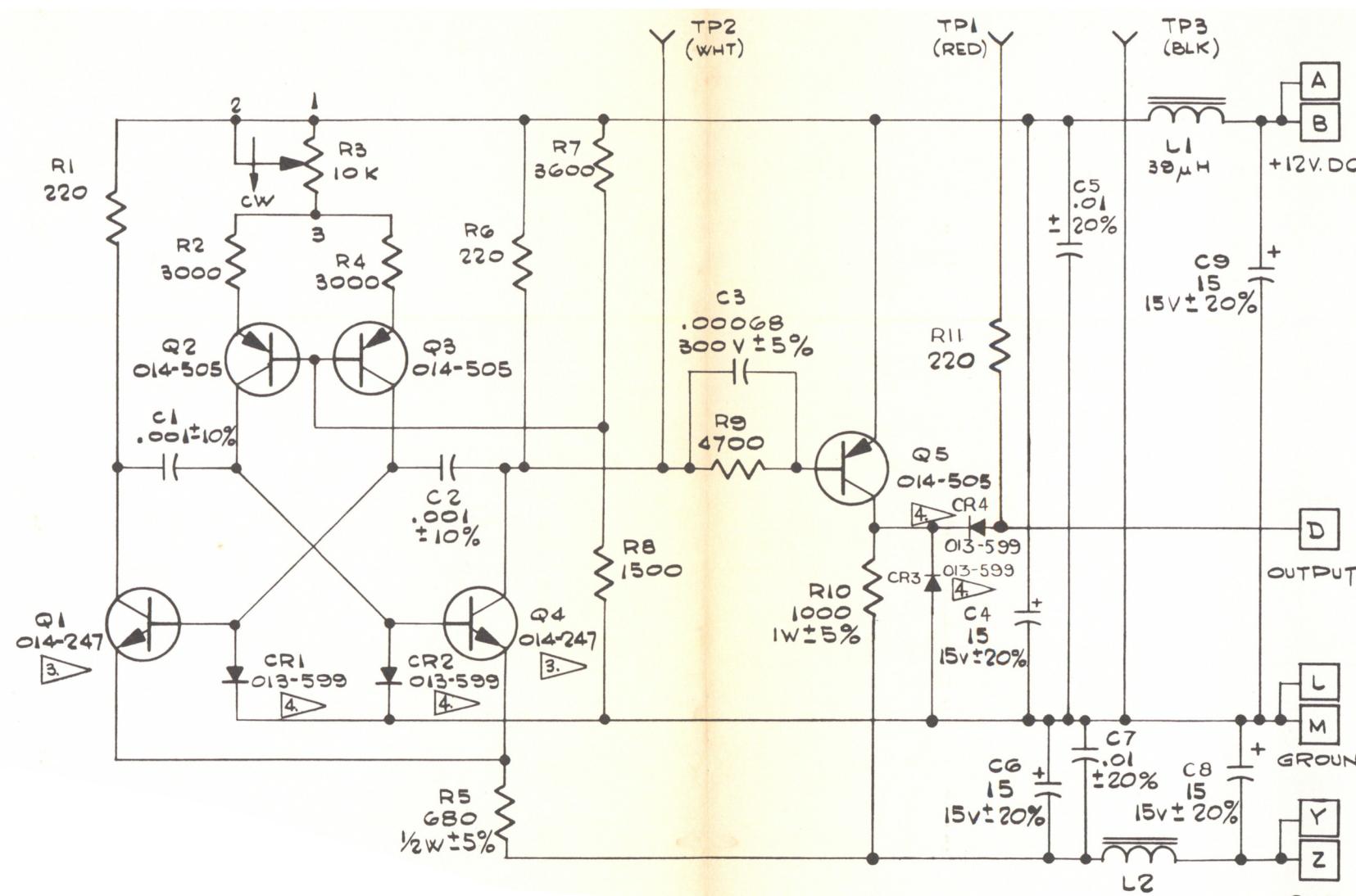
## NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.
2. ALL TRANSISTORS ARE TYPE O14-247.
3. ALL DIODES ARE TYPE O13-599.

LAST REF DES USED

R22  
CR4  
Q11  
C2

REF DES NOT USED

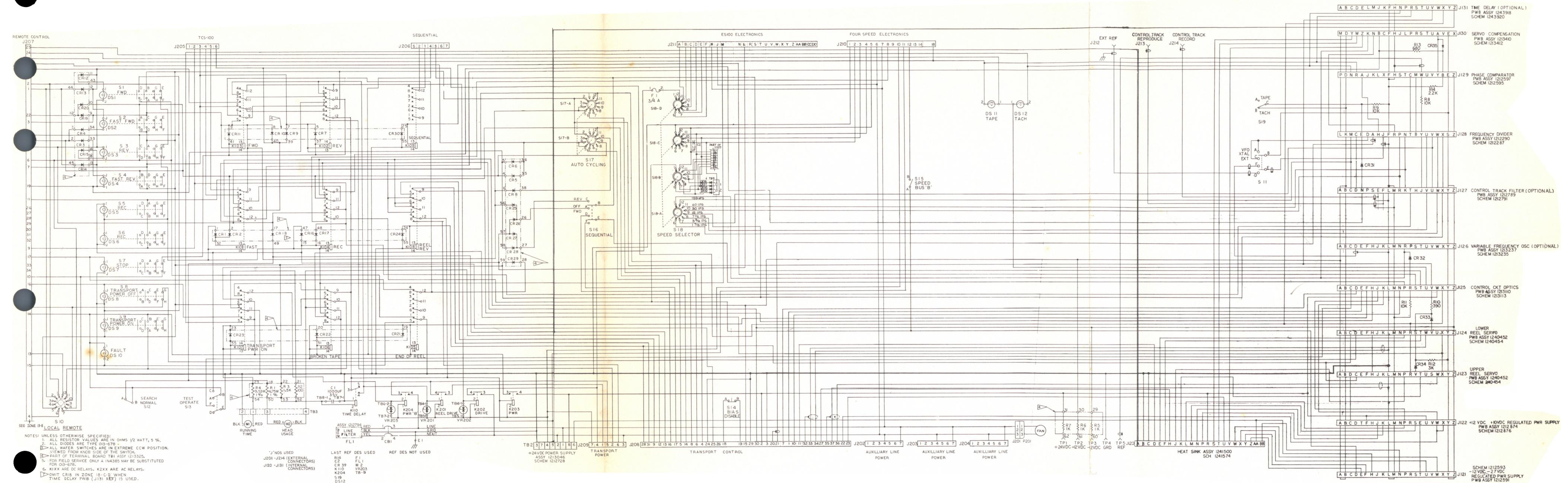


LAST REF. DES. USED

R11  
C9  
CR4  
Q5  
L2  
TP3

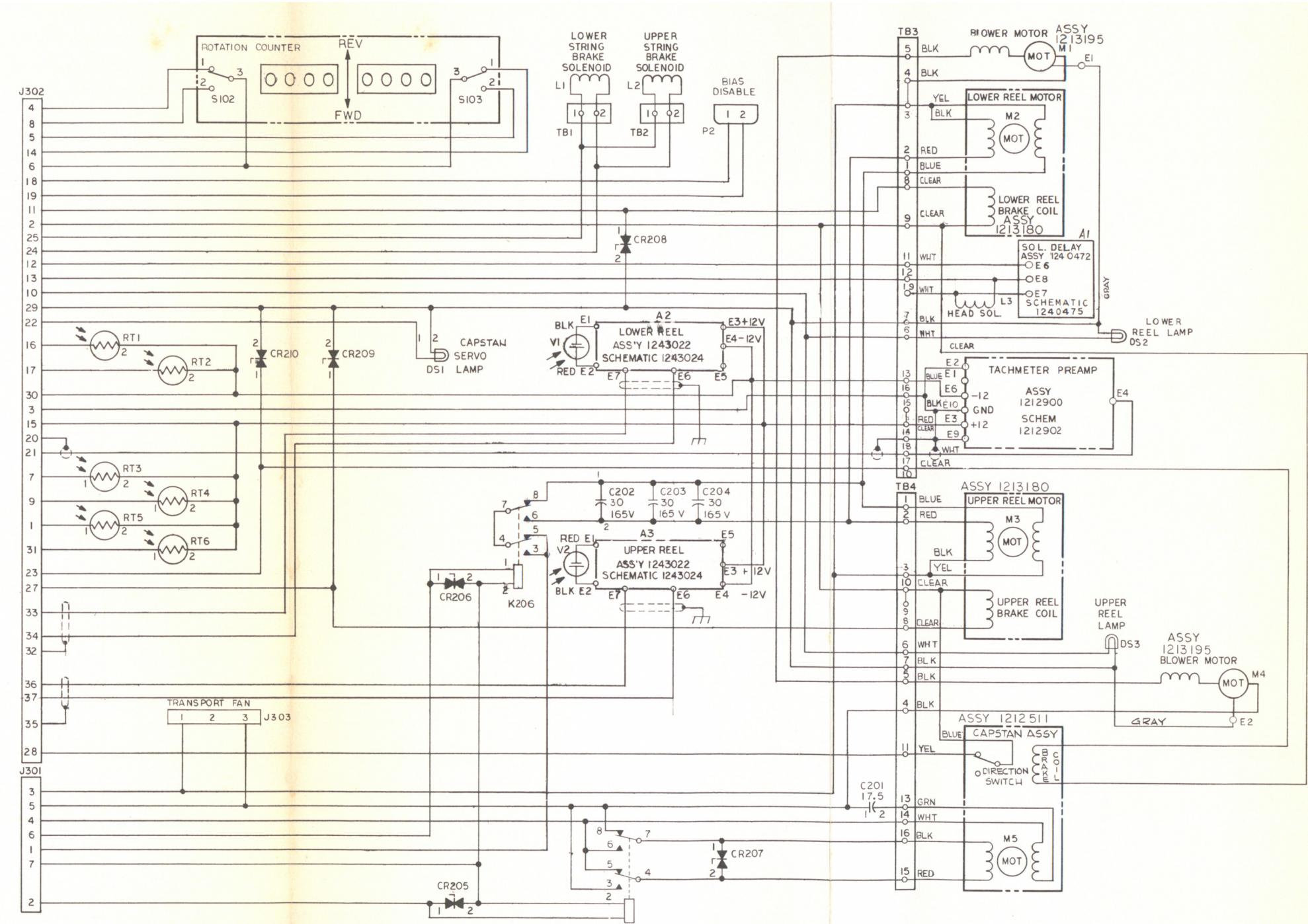
REF. DES. NOT USED

Variable Frequency Oscillator Schematic  
Dwg. No. 1213235A



REFERENCE	ITEM NUMBER	DESCRIPTION
200-60		TITLE
214458		WIRE LEAD LIST CONTRA BM HARNESS
214539		WIRE LEADLISTP. CARD, RACK ASSEMBLY
219036		WIRE LEAD LIST- RELAY CHASSIS
214779		JUMPER LIST - FRONT PANEL ASSY
214972		JUMPER LIST - CONTROL PANEL
		WIRE LEAD LIST TERMINAL BOARD

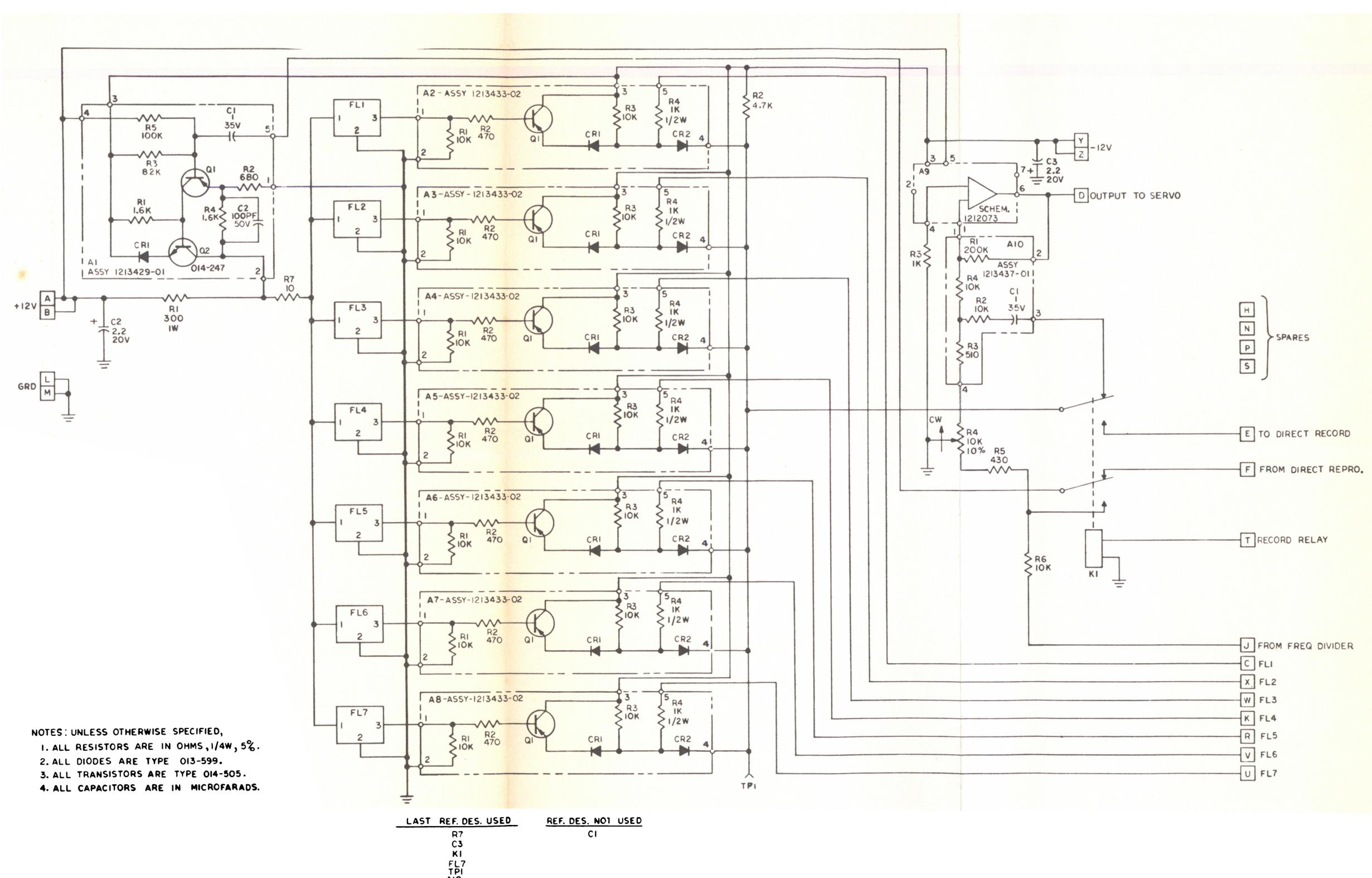
**Control Bay Schematic  
Dwg. No. 1214292B**



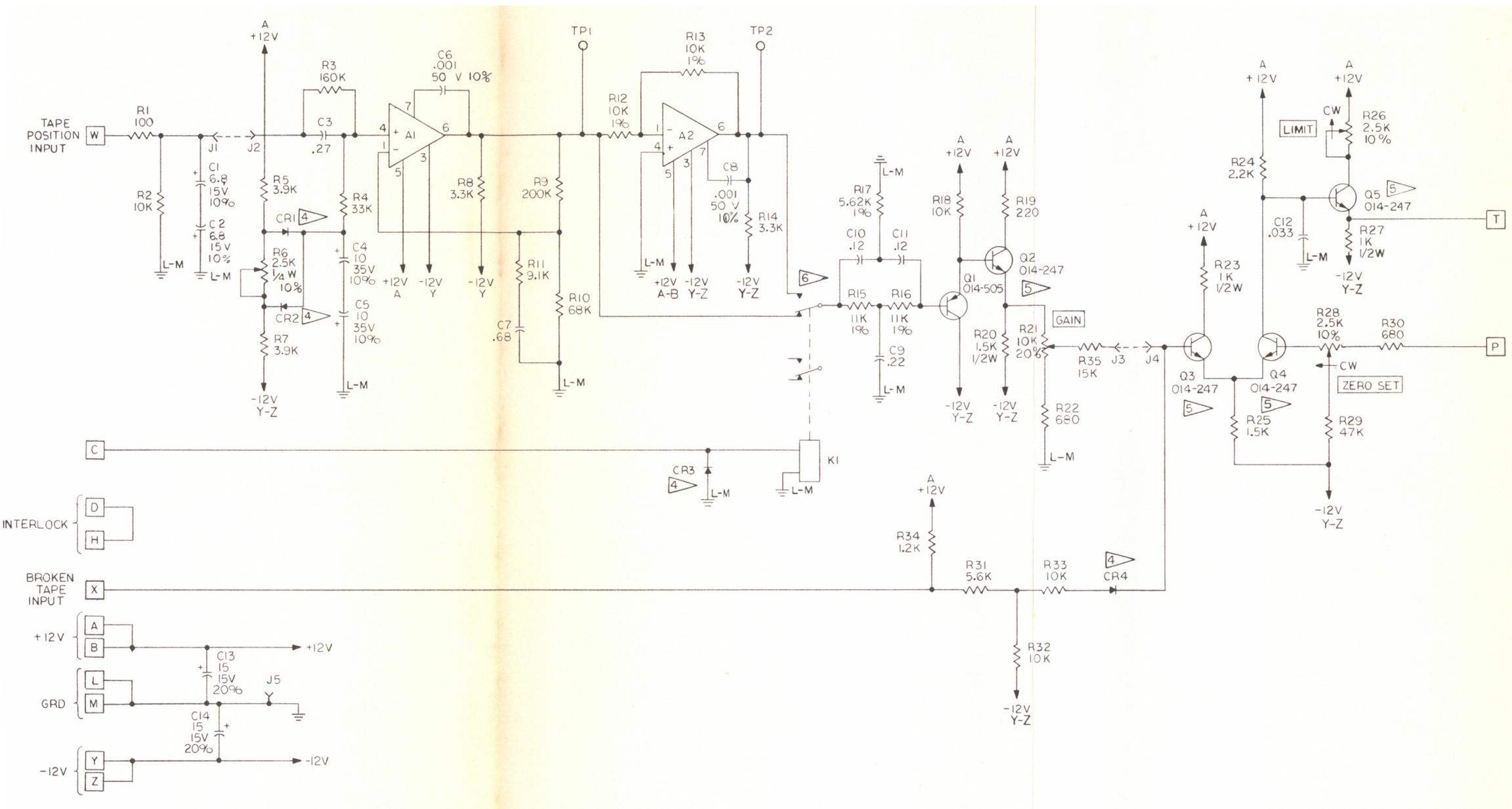
NOTES: UNLESS OTHERWISE SPECIFIED.  
 1. ALL CAPACITOR VALUES ARE IN MICROFARADS, 230 VOLTS.  
 2. ROTATION COUNTER OPTIONAL EQUIPMENT.  
 3. SI02 AND SI03 SWITCH STATES PRIOR TO NUMBER 0000.

LAST REF DES USED  
 K206 M5  
 J303 RT6  
 DS3 TB4  
 CR210 A3  
 C204 V2  
 P2  
 L3

REF DES NOT USED  
 J1 THRU J300  
 C1 THRU C200  
 CRI THRU CR204  
 K1 THRU K204  
 PI



Control Track Filters Schematic  
Dwg. No. 1216755

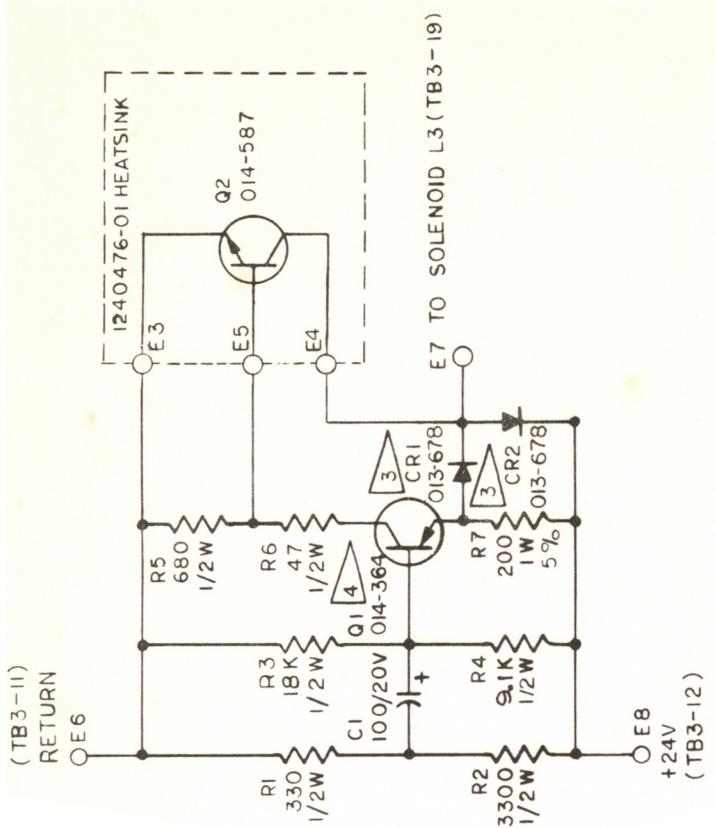
LAST REF DES USED

R35  
C14  
A2  
CR4  
Q5  
K1  
J5  
TP2

REF DES NOT USED

- NOTES: UNLESS OTHERWISE SPECIFIED.  
 1. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%.  
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS, 50V, 5%.  
 3. ALL DIODES ARE TYPE 013-599.  
 4. ▶ 013-599 DIODE IS AN AMPEX PART NO., IN914  
MAY BE USED FOR FIELD SERVICE ONLY.  
 5. ▶ 014-247 TRANSISTOR IS AN AMPEX PART NO., 2N2219  
MAY BE USED FOR FIELD SERVICE ONLY.  
 6. ▶ RELAY SHOWN IN DE ENERGIZED POSITION.  
(PIN C GROUNDED OR TRANSPORT IN FORWARD MODE)

Reel Servo Schematic  
Dwg. No. 1240454

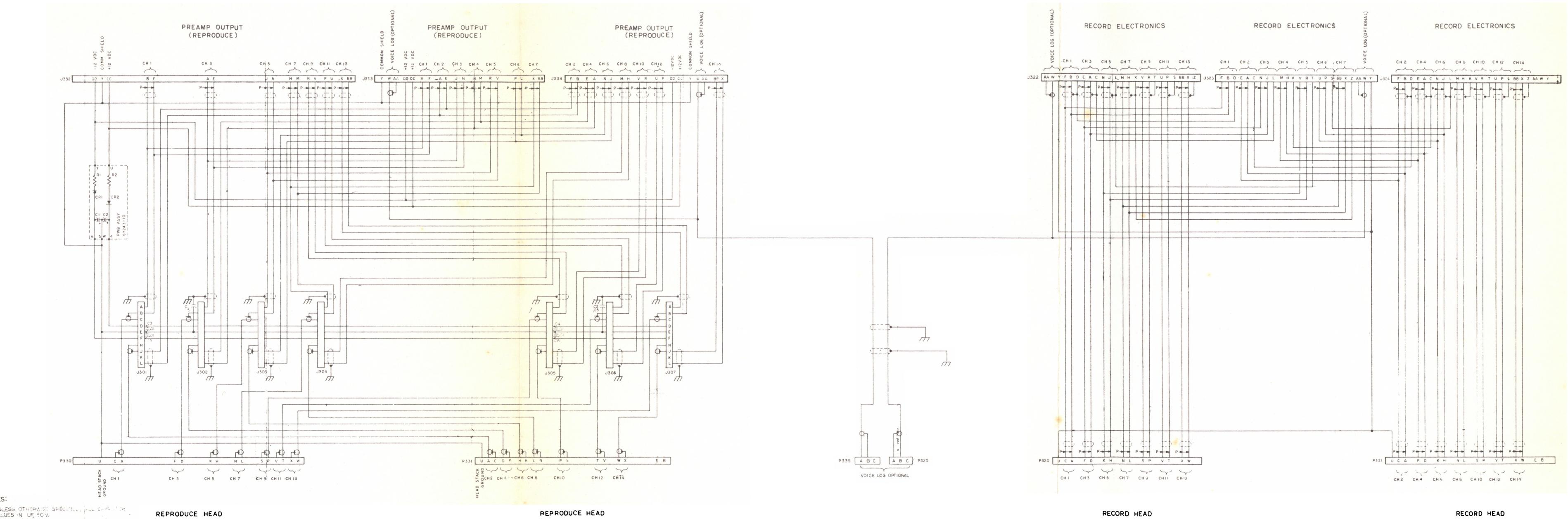


## NOTES: UNLESS OTHERWISE SPECIFIED:

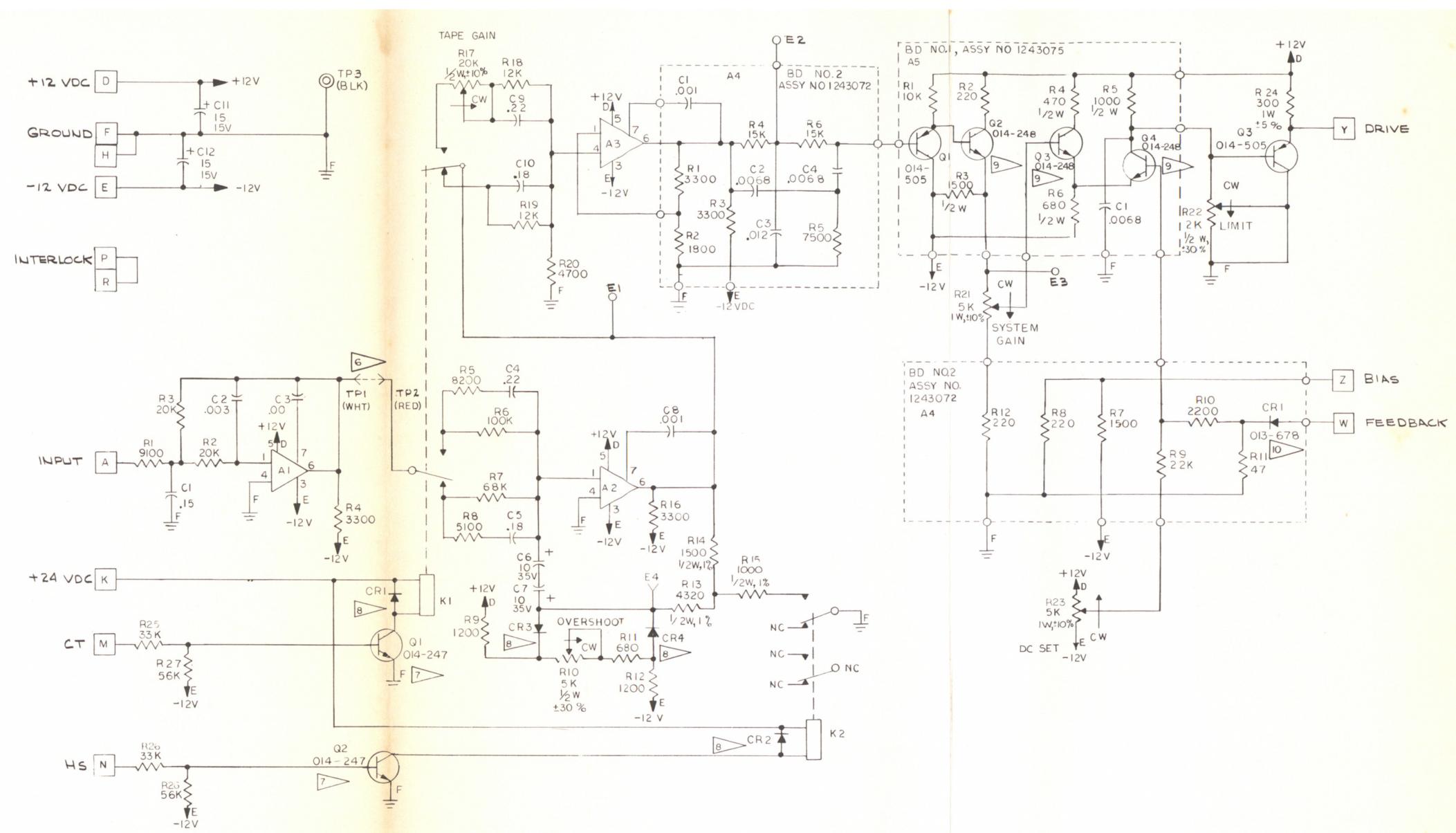
1. ALL RESISTOR VALUES ARE IN OHMS, 1/2 W, 5%.
  2. CAPACITOR VALUE IN MFD.
- 3** FOR FIELD SERVICE ONLY A IN4385 MAY BE USED  
**4** FOR FIELD SERVICE A 2N2905A MAY BE USED

LAST DESIGN USED	DESIG. NOT USED
CR2	E1
Q1	E2
R7	C1
C1	E8
E8	

(Ref. Assy. 1240473)



Reproduce Preamplifier Assembly Head Cables Schematic  
Dwg. No. 1240753B

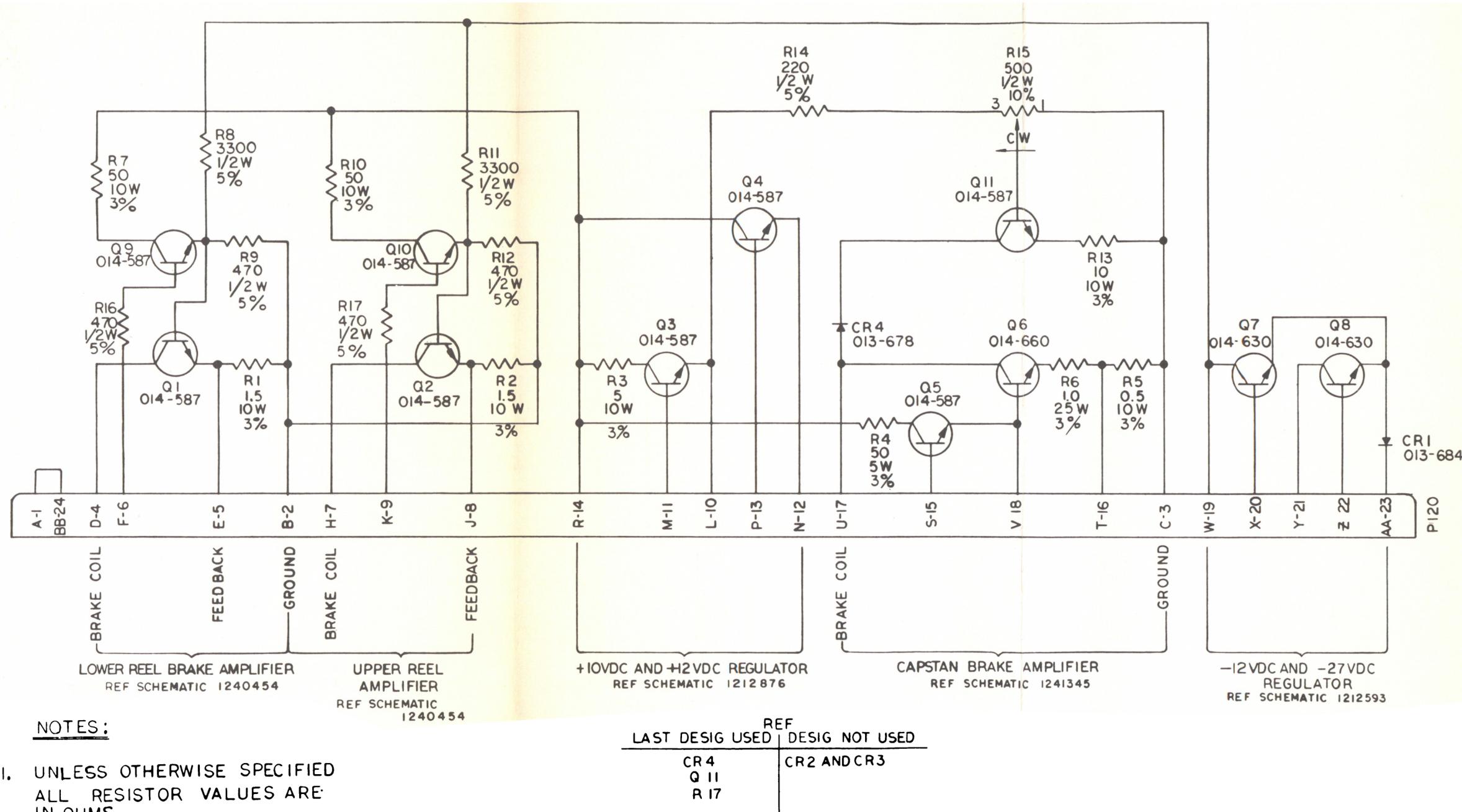


## NOTES:

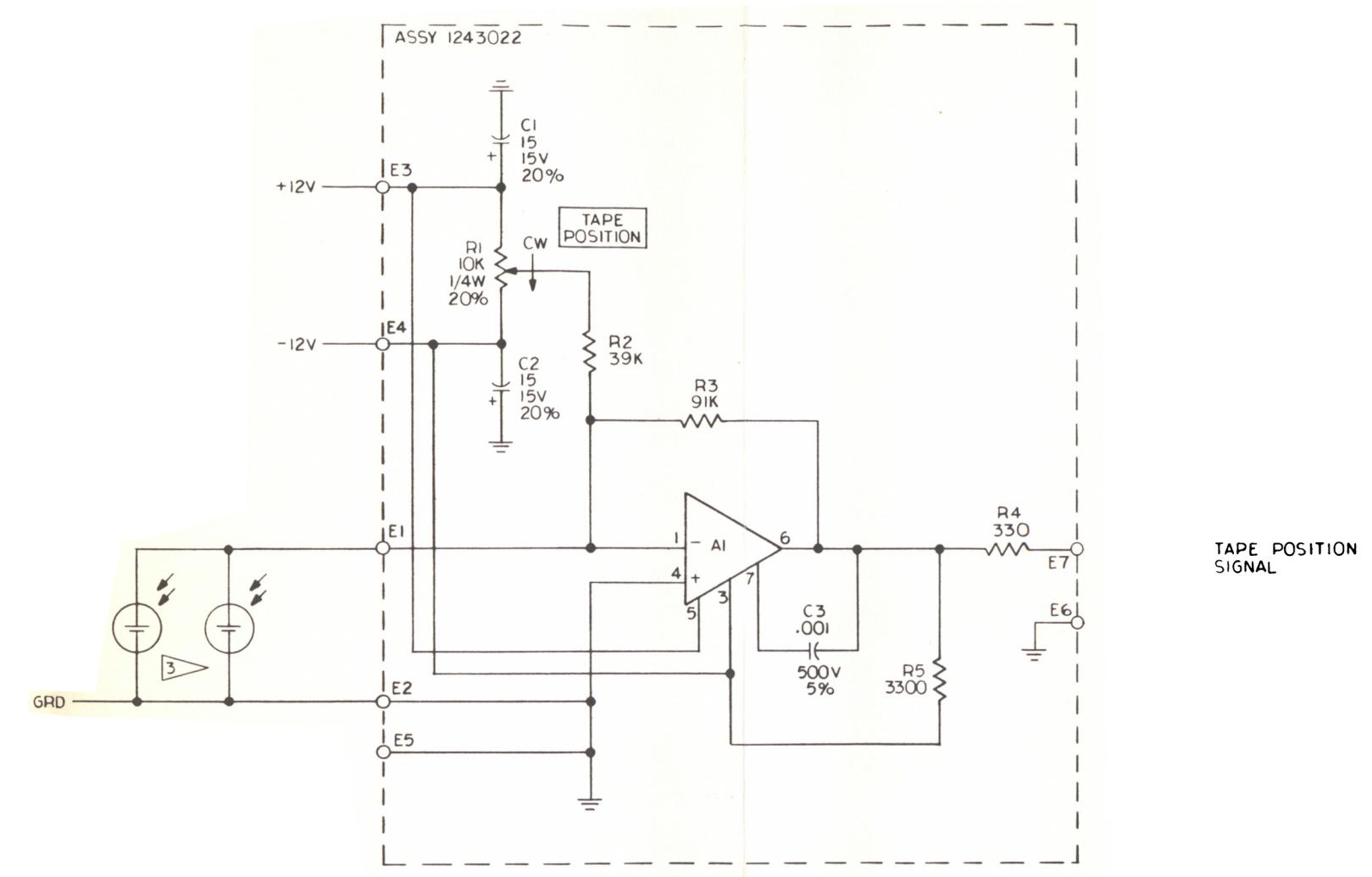
- UNLESS OTHERWISE SPECIFIED
- 1. ALL RESISTOR VALUES ARE IN OHMS,  $\frac{1}{4}W$ , 5%.
- 2. ALL CAPACITOR VALUES ARE IN MICROFARADS, 50 VOLTS.
- 3. ALL DIODES ARE 013-599.
- 4. RELAY K1 SHOWN IN DE-ENERGIZED CONDITION (TACH MODE).
- 5. RELAY K2 SHOWN IN DE-ENERGIZED CONDITION (LOW SPEED).
- 6. JUMPER REMOVABLE FOR GAIN ADJUSTMENT.
- 7. 014-247 TRANSISTOR IS AN AMPEX PART NO., 2N2219 MAY BE USED FOR FIELD SERVICE ONLY.
- 8. 013-599 DIODE IS AN AMPEX PART NO., IN914 MAY BE USED FOR FIELD SERVICE ONLY.
- 9. 014-248 TRANSISTOR IS AN AMPEX PART NO., 2N2222 MAY BE USED FOR FIELD SERVICE ONLY.
- 10. 013-678 DIODE IS AN AMPEX PART NO., IN4385 MAY BE USED FOR FIELD SERVICE ONLY.

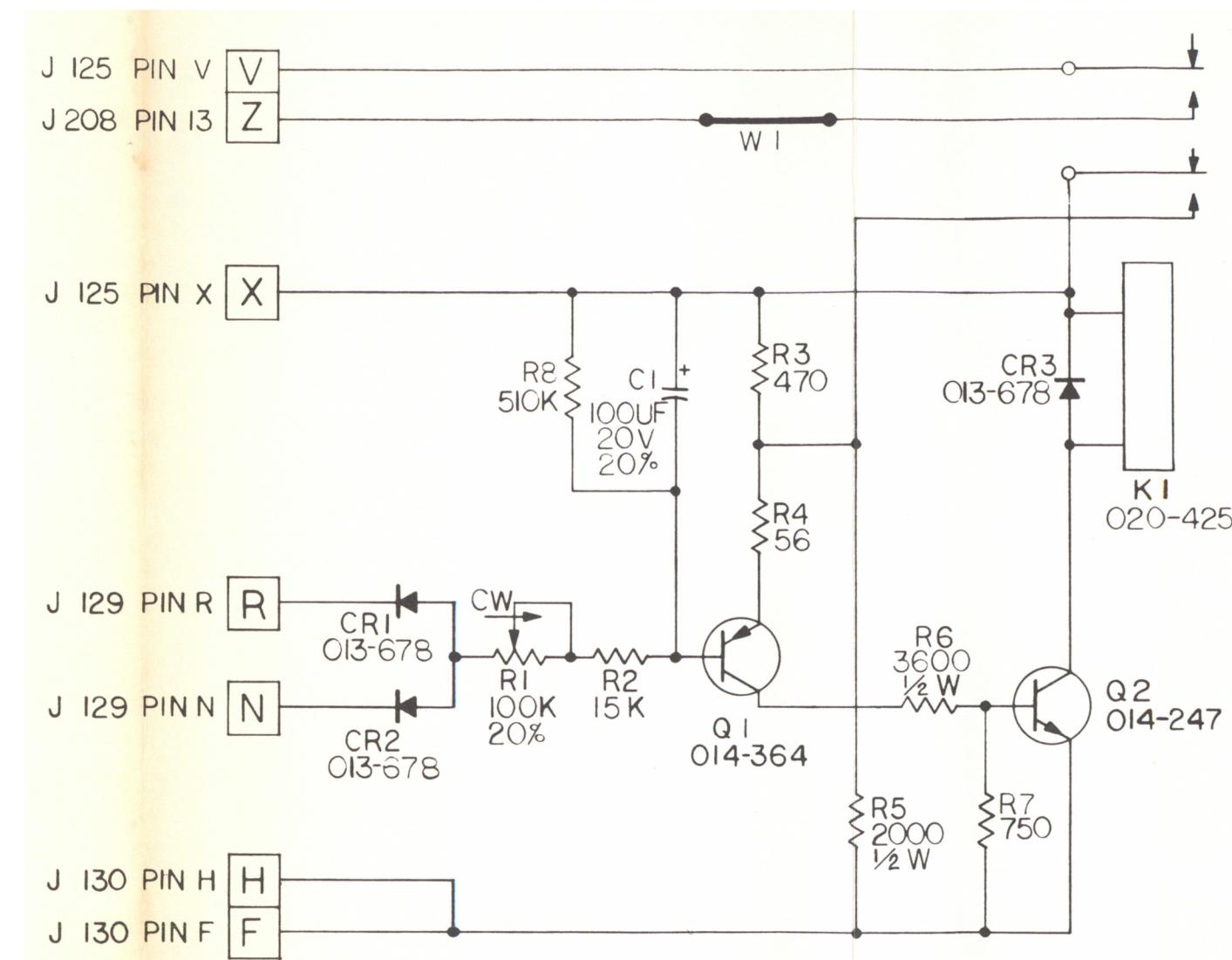
LAST REF  
DESIG USEDA5  
C12  
CR4  
E4  
K2  
Q3  
R28REF DESIG  
NOT USED

Capstan Servo Compensation and Brake Amplifier  
Schematic  
Dwg. No. 1241345A



Heat Sink Assembly Schematic  
Dwg. No. 1241574B

LAST REF DES USEDR5  
C3  
E7  
AIREF DES NOT USED



NOTES: UNLESS OTHERWISE SPECIFIED.

I. ALL RESISTOR VALUES ARE IN OHMS,  $\frac{1}{4}$  WATT,  $\pm 5\%$ .

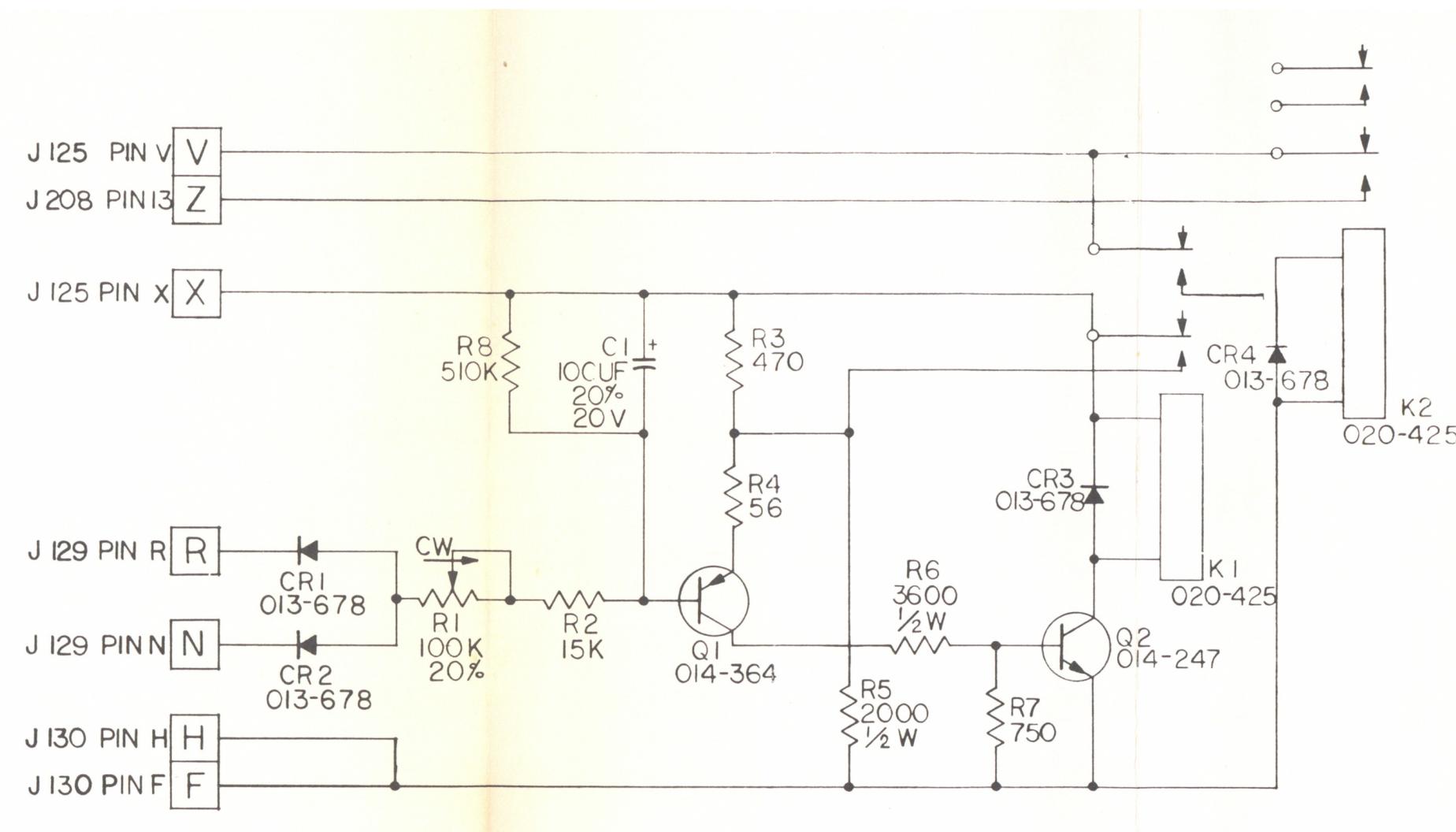
LAST REF. DESIG. USED

R8  
C1  
CR3  
Q2  
K1

PINS NOT USED

A	K	U
B	L	W
C	M	Y
D	P	
E	S	
J	T	

Time Delay Circuit Schematic  
Dwg. No. 1243920



NOTES: UNLESS OTHERWISE SPECIFIED.

- I. ALL RESISTOR VALUES ARE IN OHMS,  $\frac{1}{4}$  WATT 5%.

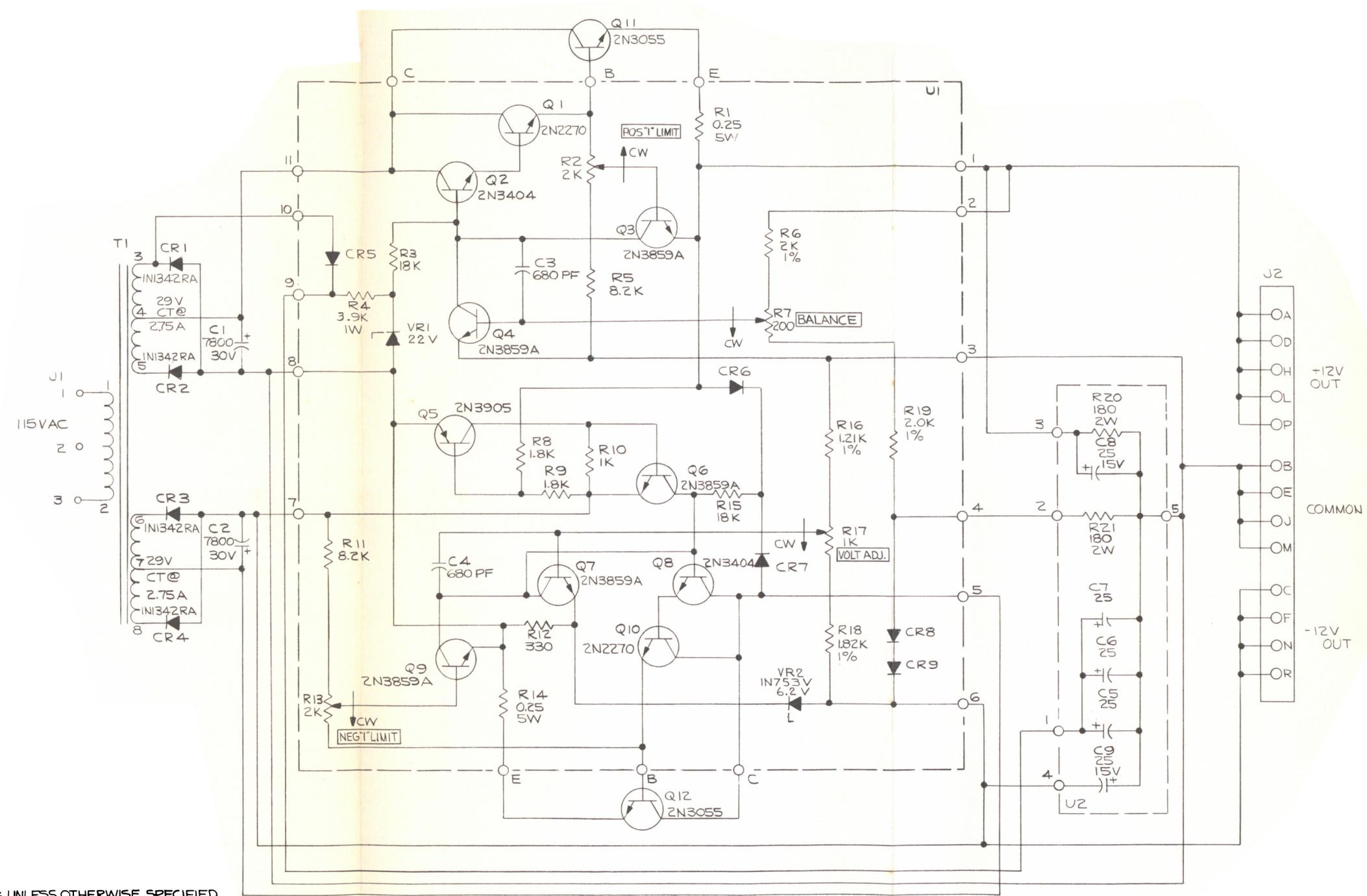
LAST REF DESIG USED

R8  
C1  
CR4  
Q2  
K2

PINS NOT USED

A	K	U
B	L	W
C	M	Y
D	P	
E	S	
J	T	

Time Delay Circuit Schematic  
Dwg. No. 1243921



NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL RESISTOR VALUES ARE IN OHMS,  $\frac{1}{2}$  W, 5%.
2. ALL CAPACITOR VALUES ARE SHOWN IN MICROFARADS,  $\geq 100$  V, 10%.

LAST REF DES USED

R21  
Q12  
C9  
CR9

REF DES NOT USED

Power Supply Schematic  
Dwg. No. 1244597

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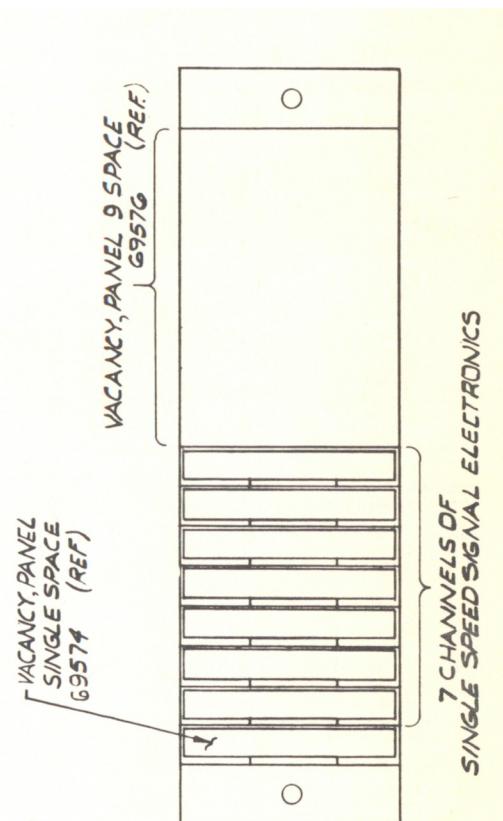
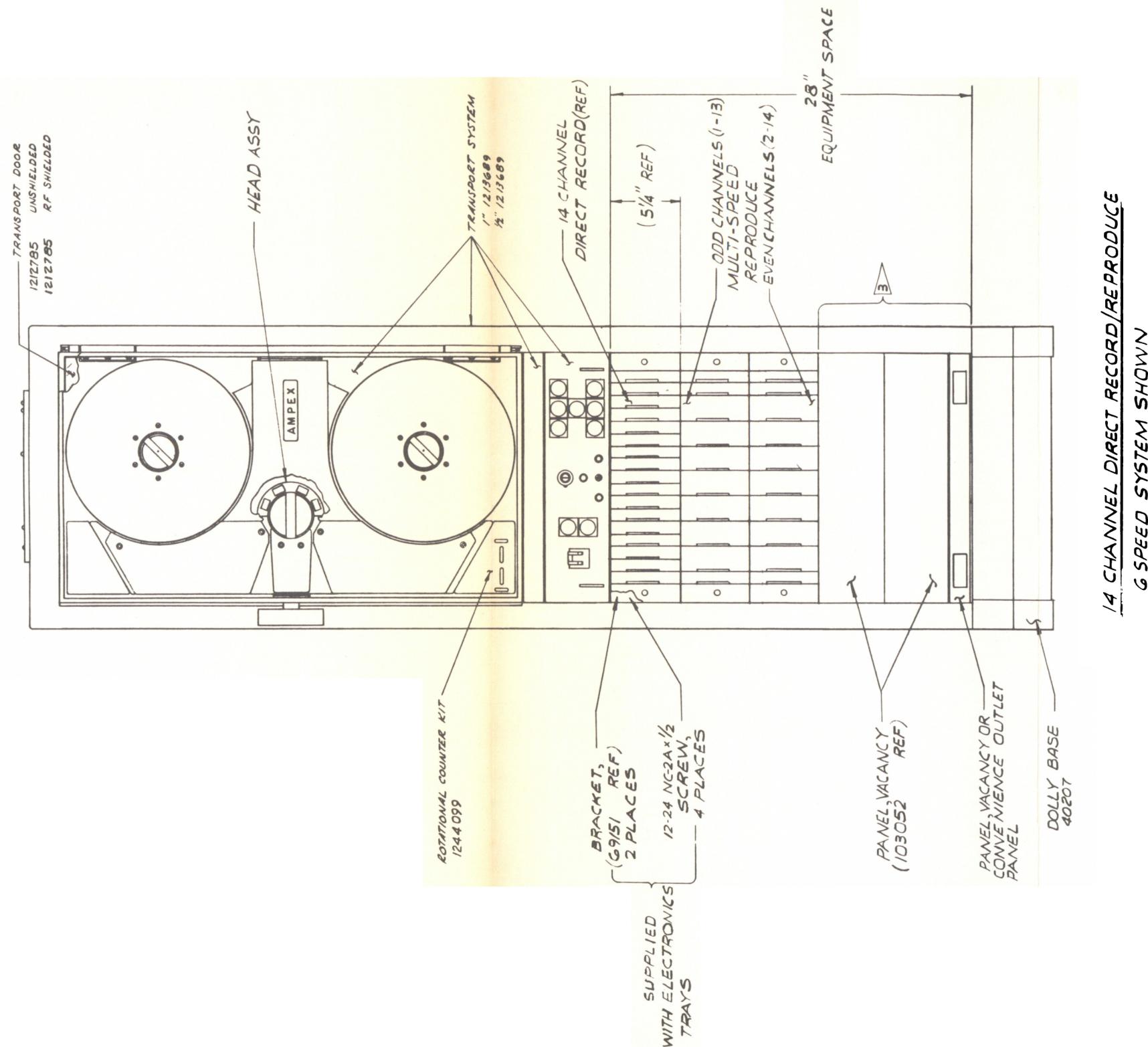
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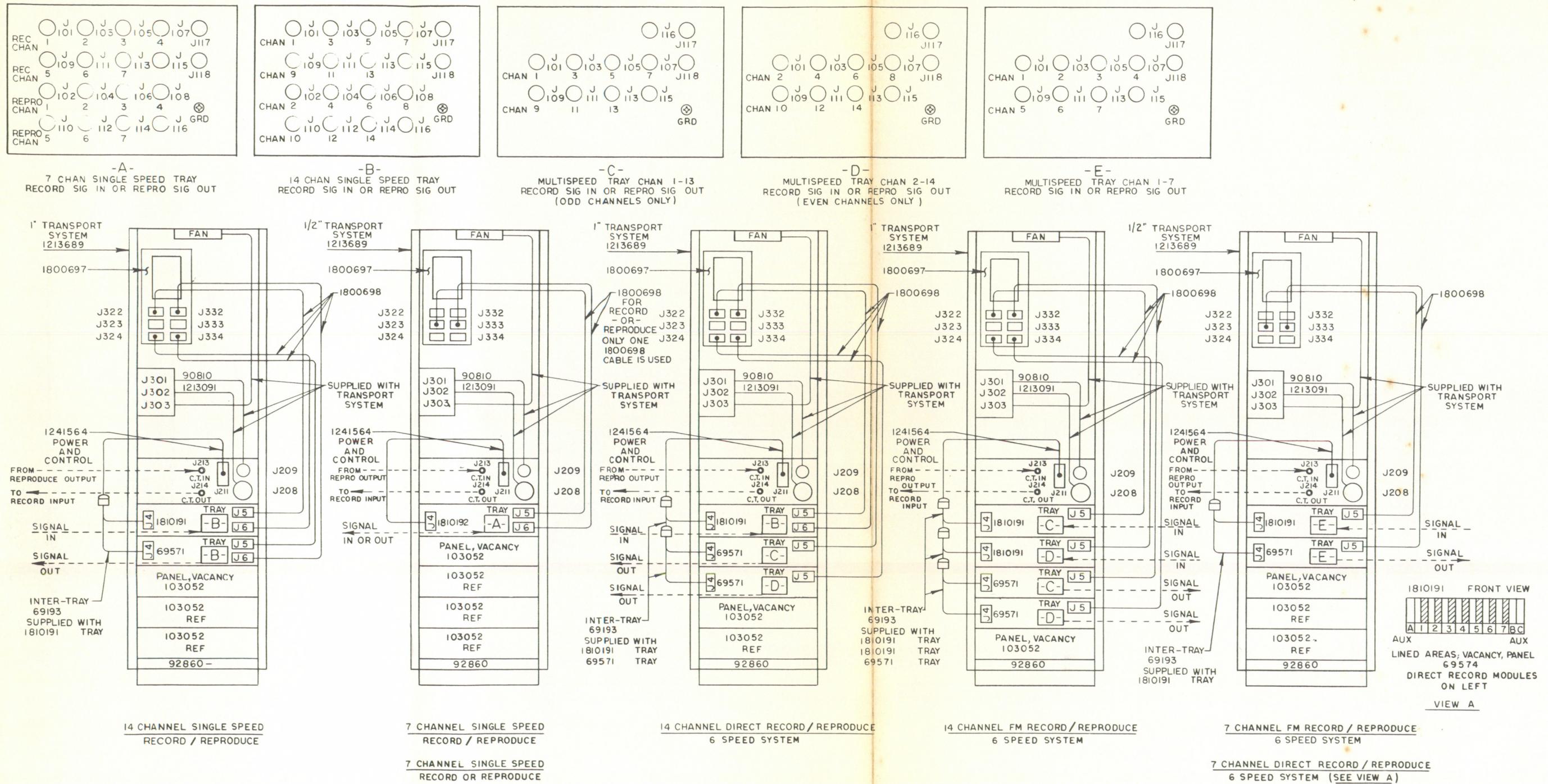
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1212731	6.3-109/110	1240452	6.3-135/136
1212875	6.3-179/180	1240472	6.3-189/190
1212789	6.3-147/148	1240473	6.3-193/194
1212874	6.3-131/132	1240745	6.3-201/202
1212900	6.3-37/38	1240750	6.3-205/206
1213028	6.3-81/82	1241344	6.3-151/152
1213032	6.3-85/86	1241500	6.3-97/98
1213038	6.3-89/90	1241538	6.3-73/74
1213043	6.3-101/102	1241564	6.3-209/210
1213046	6.3-103/104	1243022	6.3-229/230
1213091	6.3-155/156	1243918	6.3-225/226
1213110	6.3-139/140	1244099	6.3-221/222
1213180	6.3-49/50	1244322	6.3-197/198
1213195	6.3-57/58	1244368	6.3-41/42
1213202	6.3-107/108	1800547	6.3-173/174
1213237	6.3-167/168	1800548	6.3-171/172
1213322	6.3-113/114	1800697	6.3-185/186
1213325	6.3-93/94	1800698	6.3-213/214
1213372	6.3-65/66	1800733	6.3-233/234
1213375	6.3-69/70	1815050	6.3-175/176

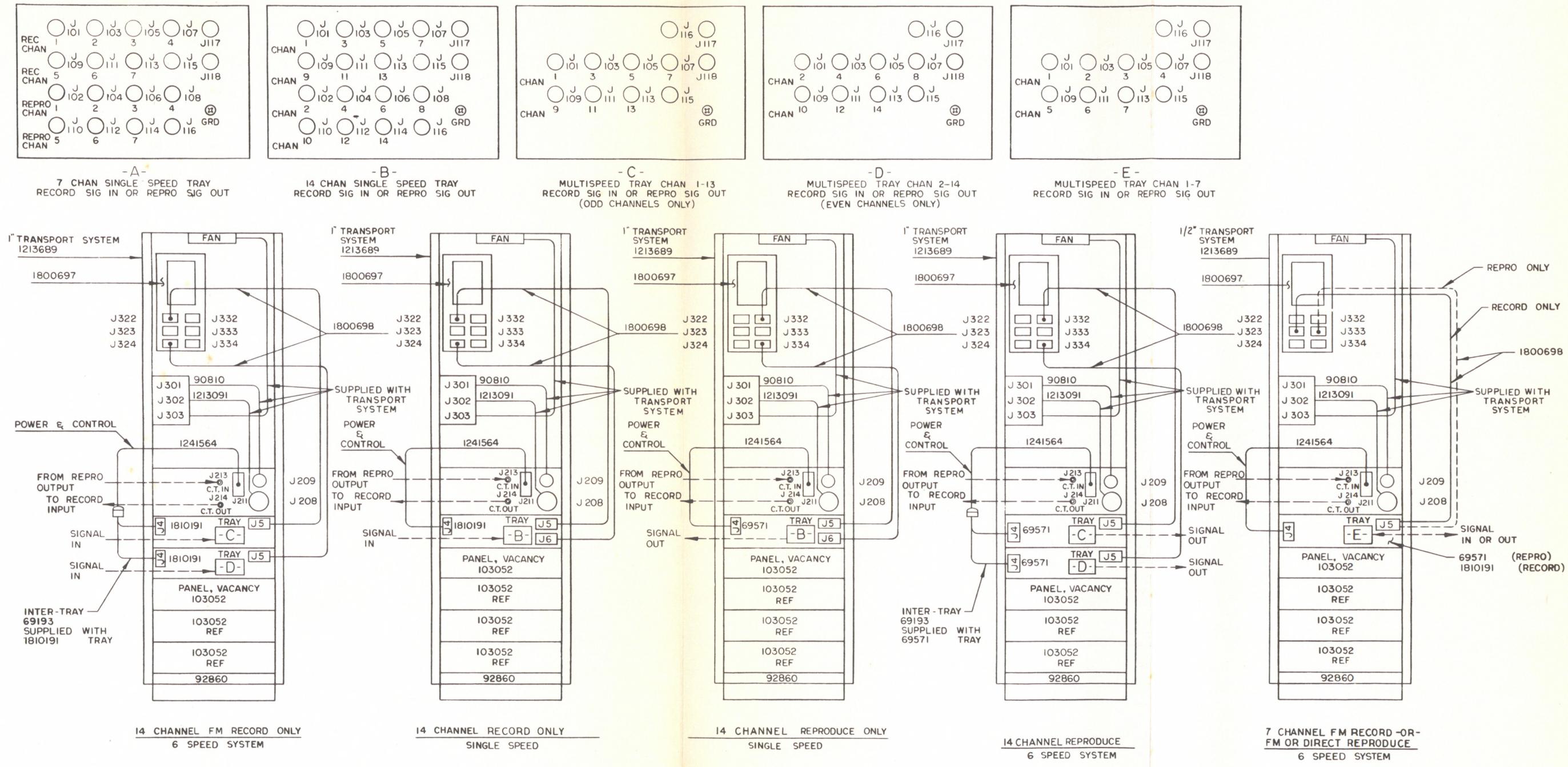


FR-1800L System and Installation  
Dwg. No. 1216954E  
(Sheet 1 of 3)



FR 1800 L SYSTEMS  
(REAR VIEW)

**FR-1800L System and Installation  
Dwg. No. 1216954E  
(Sheet 2 of 3)**



FR 1800 L SYSTEMS  
(REAR VIEW)

**FR-1800L System and Installation  
Dwg. No. 1216954E  
(Sheet 3 of 3)**

FR-1800L SYSTEM INSTALLATION				CATALOG NO.	1216954	Sheet 1 of 2					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR CODE	QUANTITY REQUIRED PER VERSION					
1	1213689			TRANSPORT SYSTEM 1" and 1/2"							
2	1815072			HEAD ASSEMBLY, 300 KC, 1" record and reproduce							
3	1815073			HEAD ASSEMBLY, 300 KC, 1/2" record reproduce							
4	28031			REEL, Precision, 1/2" x 14"							
5	28038			REEL, Precision, 1" x 14"							
6	750-230			TAPE, Magnetic, precision reel, 1" x 14"							
7	750-232			TAPE, Magnetic, precision reel, 1/2" x 14"							
8	750-241			TAPE, Magnetic, precision reel, 1" x 14"							
9	750-242			TAPE, Magnetic, precision reel, 1/2" x 14"							
10	750-244			TAPE, Magnetic, 1/2" x 14", reel							
11	750-245			TAPE, Magnetic, 1" x 14", reel							
12	1800547			1" GUIDE ASSEMBLY CONVERSION KIT							
13	1800548			1/2" GUIDE ASSEMBLY CONVERSION KIT							
14	1244099			COUNTER INSTALLATION KIT, Reel Rotation and Footage							
15	1212785			COVER DOOR TRANSPORT							
16	1800697			HEAD CABLES AND PRE-AMPLIFIER HOUSING ASSEMBLY							
17	1810191			TRAY ASSEMBLY, Record							
18	69571			TRAY ASSEMBLY, Reproduce							
19	1810192			TRAY ASSEMBLY, Record/Reproduce							
20	48921			CABLE SEQUENTIAL, 15 feet							
21	1241564			CABLE, Power and Control							
22	1800698			CABLE SIGNAL, Record/Reproduce							
23	69231			CABLE SIGNAL, FR-100C Interconnecting, 72" and 84"							
24	1800242			GROUND STRAP							
25	46390			PLUG-IN OUTPUT FILTER, 1-7/8 ips thru 60 ips							
26	69101			PRINTED WIRING ASSEMBLY DUAL ANALOG PRE-AMPLIFIER							
27	69103			PRINTED WIRING ASSEMBLY DIRECT RECORD AMPLIFIER							
28	69105			PRINTED WIRING ASSEMBLY DIRECT REPRODUCE AMPLIFIER							
29	69106			PRINTED WIRING ASSEMBLY DIRECT REPRODUCE AMPLIFIER, Multi-speed							

1216954E

## FR-1800L SYSTEM INSTALLATION

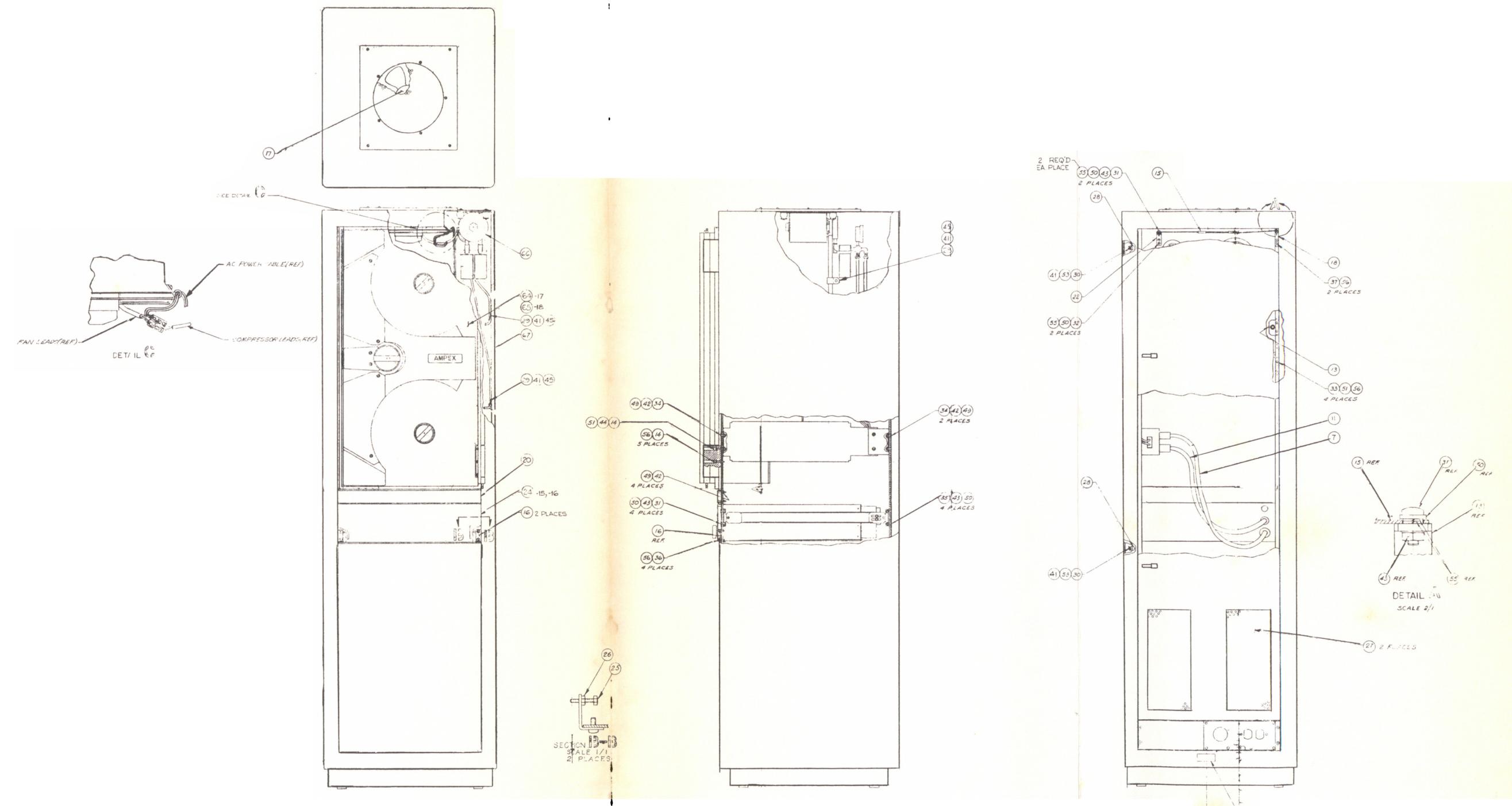
CATALOG NO. 1216954

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
30	69107			PRINTED WIRING ASSEMBLY RECORD AMPLIFIER, F M								
31	69108			PRINTED WIRING ASSEMBLY FREQUENCY MODULATOR REPRODUCE AMPLIFIER								
32	69109			PRINTED WIRING ASSEMBLY FREQUENCY MODULATOR AMPLIFIER, Multi-Speed								
33	69110			PRINTED WIRING ASSEMBLY REPRODUCE AMPLIFIER, Multi-Speed								
34	69111			PRINTED WIRING ASSEMBLY PDM RECORD AMPLIFIER								
35	69112			PRINTED WIRING ASSEMBLY PDM REPRODUCE AMPLIFIER								
36	69116			PRINTED WIRING ASSEMBLY SERVICE MODULE TYPE 1								
37	69117			PRINTED WIRING ASSEMBLY DIRECT REPRODUCE EQUALIZER, 1-7/8 ips thru 60 ips								
38	69118			PRINTED WIRING ASSEMBLY SERVICE MODULE TYPE 2								
39	1212789			PRINTED WIRING ASSEMBLY CONTROL TRACK FILTERS								
40	1213633			PRINTED WIRING BOARD ASSEMBLY CARD EXTENSION								
41	1243918			PRINTED WIRING BOARD ASSEMBLY TIME DELAY CIRCUIT								
42	69574			PANEL, Vacancy Assembly, single space								
43	69576			PANEL, Vacancy Assembly, 7, 8, and 9 space								
44	103052			PANEL, Vacancy Assembly, 1-3/4", 3-1/2", 5-1/4", 7", and 14"								
45	1815050			HEAD DEGAUSSER								
46	22070	SE-10		TAPE DEGAUSSER								
47	68600	SE-10		INSTRUCTION MANUAL								
48	40207			DOLLY SINGLE RACK								
49	92860			CONVENIENCE OUTLET								
50	69650			ES-100 SIGNAL ELECTRONICS INSTRUCTION MANUAL								
51	1800711			REMOTE CONTROL KIT								
52	1800759			INSTALLATION KIT								
53	1800733			VOICE LOG KIT, 1" and 1/2"								
54	1800550			INSTRUCTION MANUAL, FR-1800L								

1216954E

6. 3-6



VERSION	DESCRIPTION
1213689-17	1" TRANSPORT
1213689-18	1/2" TRANSPORT

FR-1800 Recorder/Reproducer (1 Inch)  
Dwg. No. 1213689-19, -20L

TRANSPORT SYSTEM				CATALOG NO. 1213689	Sheet 1 of 2			
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-19	-20	
7	90810-12			TRANSPORT POWER CABLE		1	1	
11	1213091-03			CABLE ASSEMBLY, Transport Control		1	1	
13	1213221-01			STRIKER PLATE, Latch Transport		1	1	
14	1213622-02			SCREW, Shoulder		6	6	
15	1217436-01			HOLDBACK, Door		1	1	
16	1217130-04			LATCHPLATE		2	2	
18	1209487-01			BRACKET, Holdback Arm, transport		1	1	
20	92843-30			PANEL, Front Filler		1	1	
22	1217136-01			BRACKET, Holdback		1	1	
23	6000022-01			NAMEPLATE, Identification		1	1	
24	1212531-08			CONTROL BAY ASSEMBLY		1	1	
25	91807-02			PIN, Latch		2	2	
26	492-060			NUT, Hex, 10-32		2	2	
27	1214363-01			FILTER		2	2	
28	302-036			CLAMP, Cable, 3/8 ID		3	3	
30	471-069			SCREW, Machine, pan head, 6-32 x 3/8		2	2	
31	471-089			SCREW, Machine, pan head, 10-32 x 1/2		6	6	
32	470-415			SCREW, Cap, 10-32 x 1-1/8		2	2	
33	471-464			SCREW, Machine, pan head, 12-24 x 5/8		4	4	
34	471-347			SCREW, Machine, flat head, 8-32 x 1/2		3	3	
35	471-356			SCREW, Machine, flat head, 10-32 x 1/2		4	4	
36	471-463			SCREW, Machine, pan head, 12-24 x 3/8		4	4	
37	471-451			SCREW, Machine, pan head, 12-24 x 1/2		2	2	
38	470-050			SCREW, Cap, 1/4-20 x 1-1/4		4	4	
39	1217484-01			BLOCK, Fastener		2	2	
41	506-013			D WASHER, #6		4	4	
42	496-006			NUT, Keps, #8-32		7	7	
43	496-007			NUT, Keps, #10-32		10	10	
44	496-008			NUT, Keps, #12-24		1	1	
49	501-911			WASHER, Flat, #8		7	7	
50	501-908			WASHER, Flat, #10		12	12	
51	501-029			WASHER, Flat, #12		5	5	
53	502-003			WASHER, Lock, #6		2	2	
55	502-005			WASHER, Lock, #10		6	6	
56	502-049			WASHER, Lock, #12		15	15	
57	502-006			WASHER, 1/4		2	2	

1213689L

## TRANSPORT SYSTEM

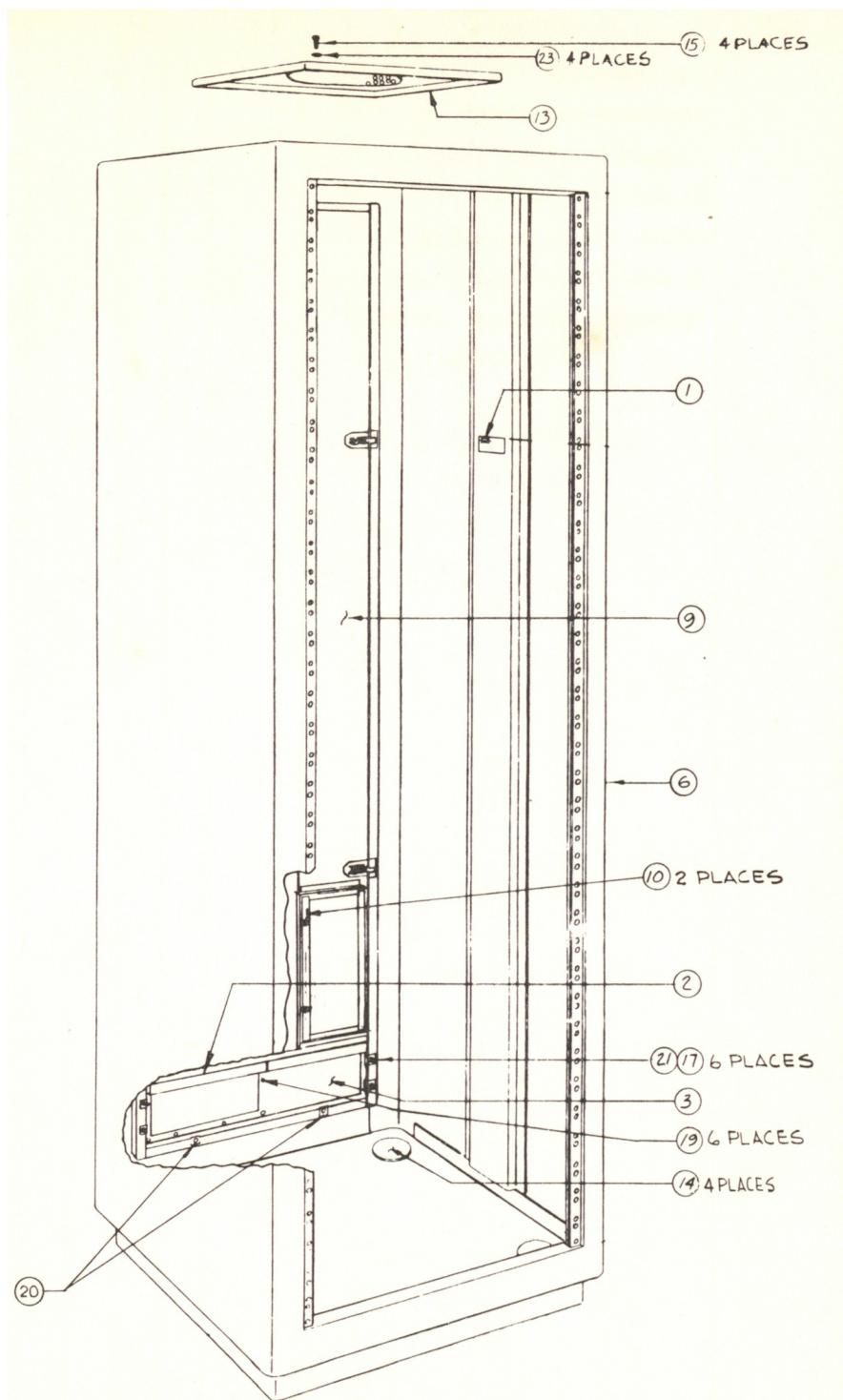
CATALOG NO. 1213689

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-19	-20				
63	1214813-04			FAN ASSEMBLY		1	1				
66	1244322-01			COMPRESSOR ASSEMBLY		1	1				
67	1212532-02			CABINET ASSEMBLY		1	1				
68	302-077			CLAMP, Cable, 1/2 ID		2	2				
69	476-199			SCREW, #6 x 1/2 long, self tap		3	3				
70	1212500-19			TRANSPORT ASSEMBLY, 1" tape		1	-				
71	1212500-20			TRANSPORT ASSEMBLY, 1/2" tape		-	1				

1213689L

6.3-10

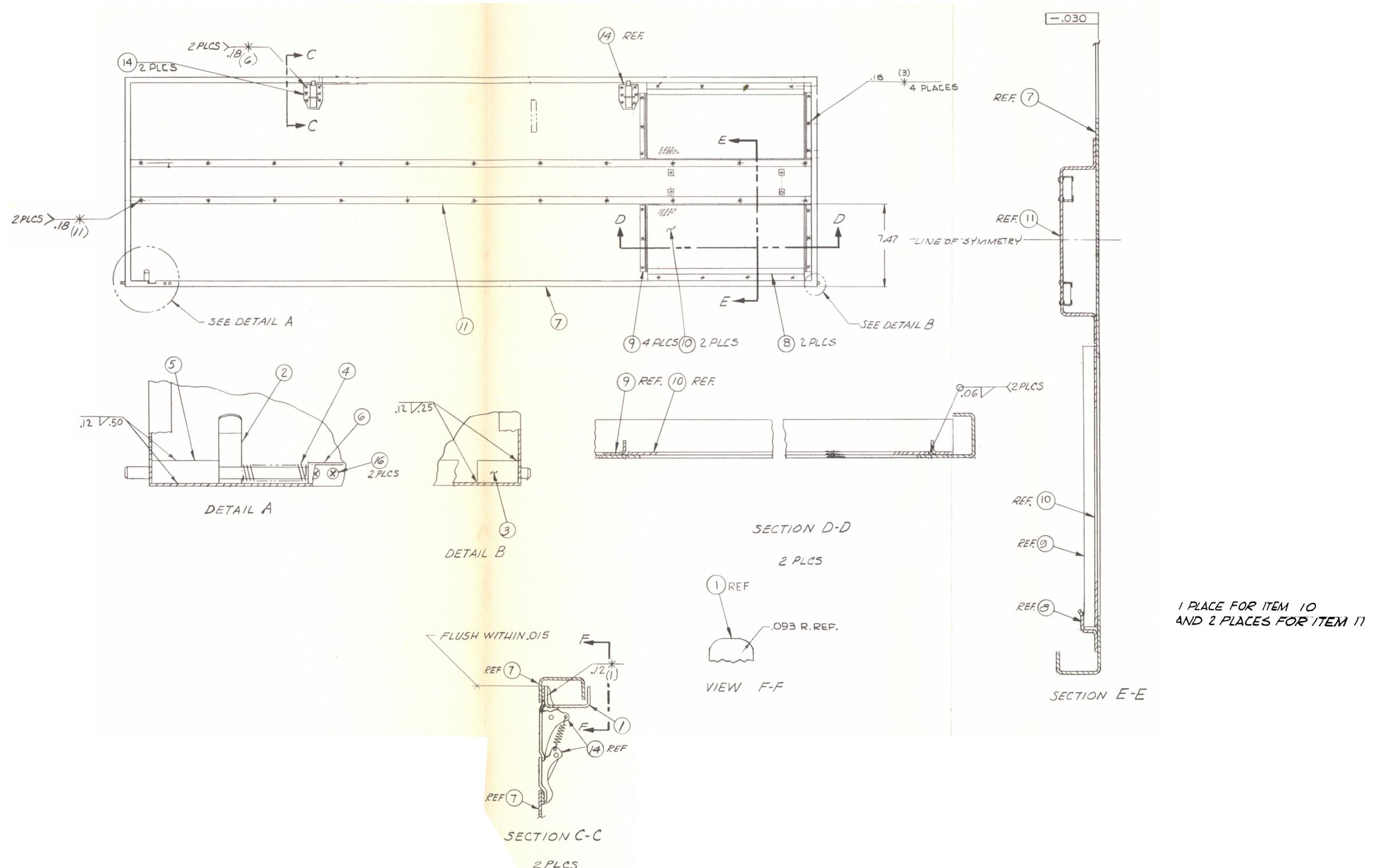


Cabinet Assembly  
Dwg. No. 1212532-02F

CABINET ASSEMBLY				CATALOG NO. 1212532	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
					-02						
1	6000035-01			IDENTIFICATION PLATE		1					
2	1220434-10			OUTLET PANEL		1					
3	1220476-10			REAR PANEL		1					
6	1213690-03			CABINET, Neldment		1					
9	1214357-01			DOOR ASSEMBLY		1					
10	1214359-02			RETAINER, Filter		2					
13	1220475-30			VENT COVER		1					
14	251-028			PLUG, 2 inch diameter		4					
15	471-076			SCREW, Machine, pan head, phillips drive, 8-32 NC-2A x 1/4 long		4					
17	472-422			SCREW, Machine, pan head, phillips drive, #10-24 NC-2A x 1-1/2 long		6					
19	476-002			SCREW, Self Tapping, pan head, phillips drive, 6-32 x 1/4 long		6					
20	497-028			SPEED NUT, U type, #10-24		2					
21	501-011			WASHER, Flat, #10		6					
23	502-026			WASHER, Lock, internal tooth, #8		4					

1212532F

6.3-13/14

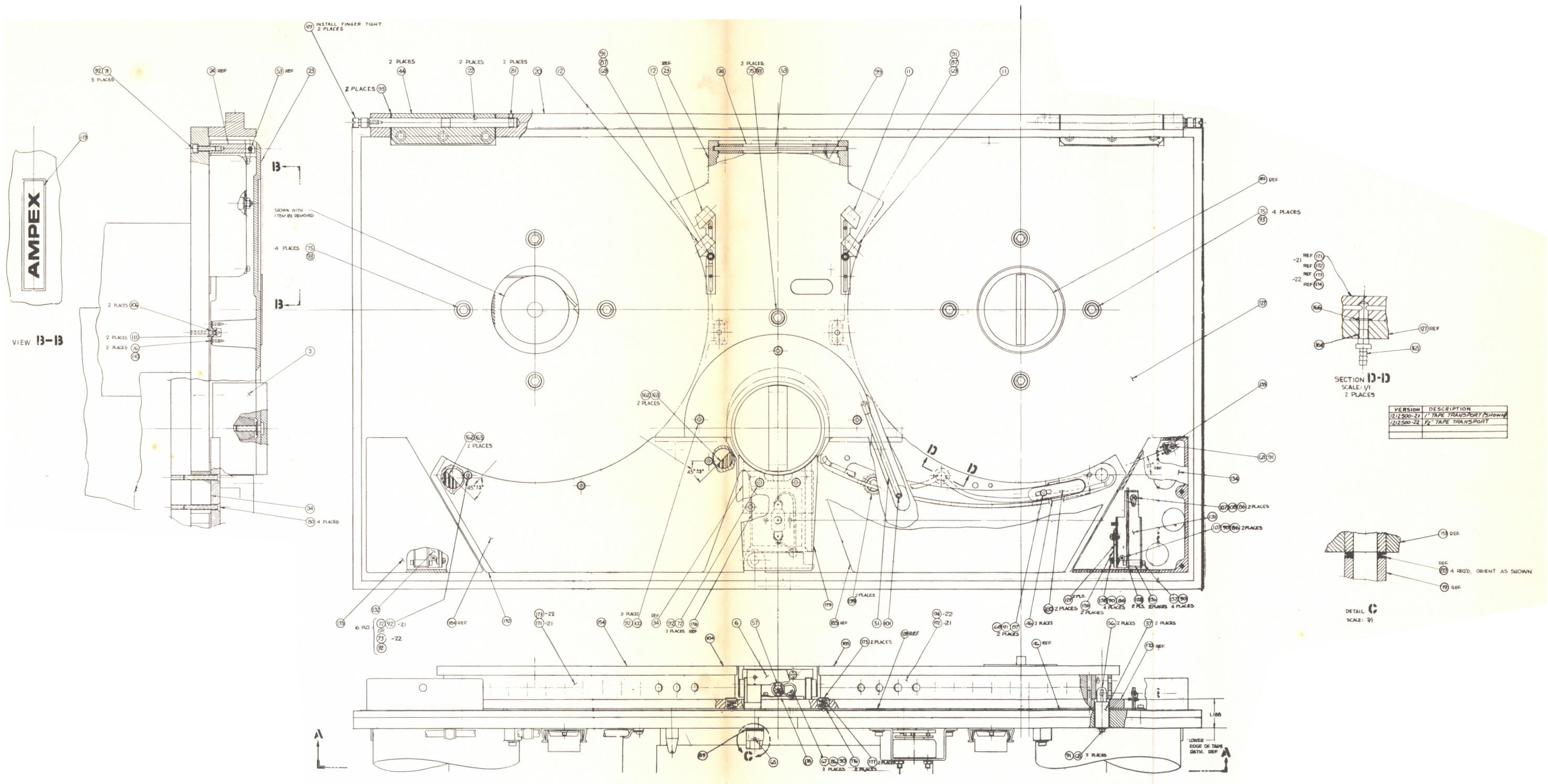


**Cabinet Door Assembly  
Dwg. No. 1214357-01A**

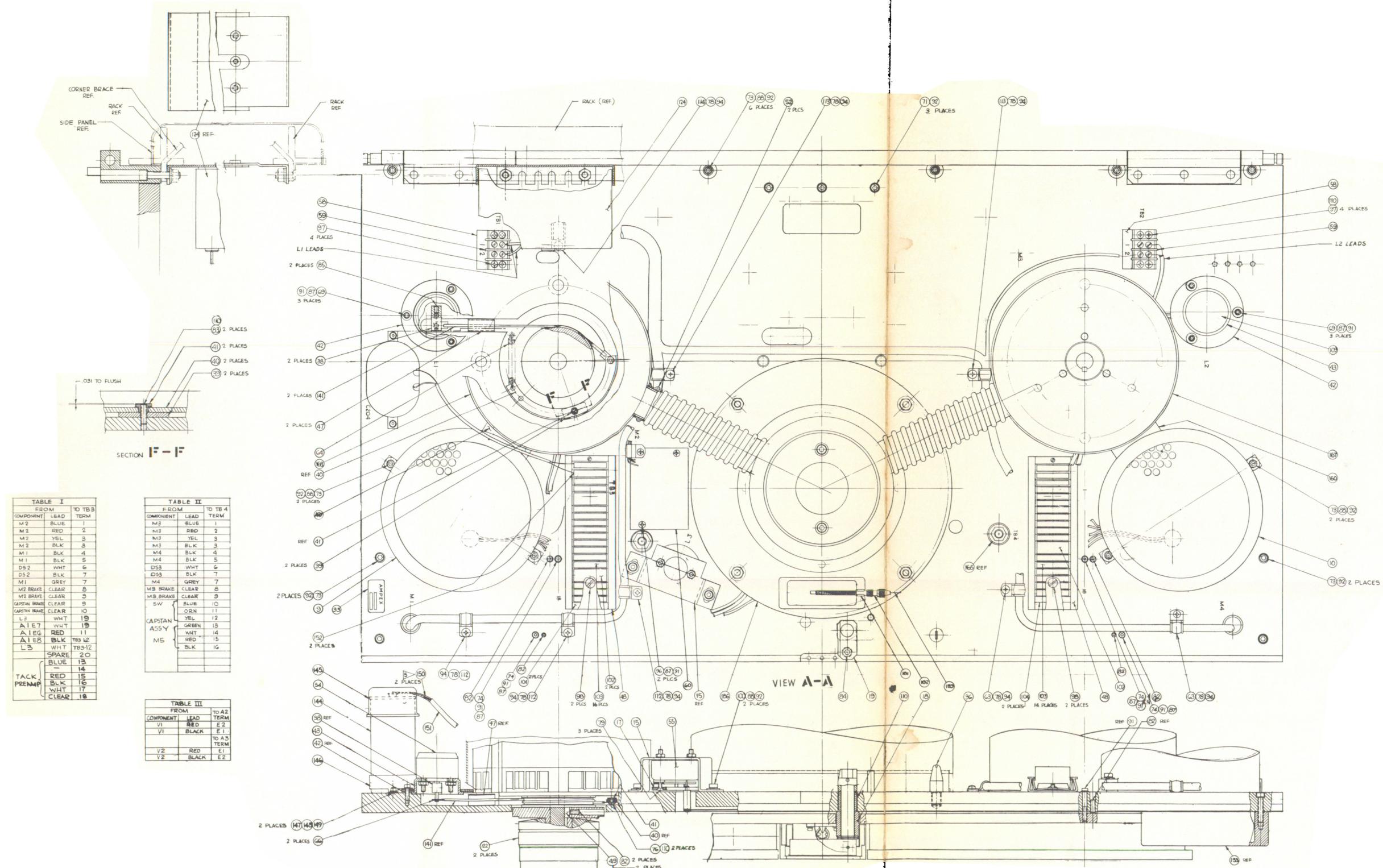
CABINET DOOR ASSEMBLY				CATALOG NO. 1214357	Sheet 1 of 1				
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION			
						-01			
1	100016-01			CATCH		2			
2	100017-01			PIN ASSEMBLY		1			
3	100020-01			BOTTOM PIN		1			
4	100021-01			SPRING		1			
5	100022-01			UPPER RETAINER		1			
6	100023-01			LOWER RETAINER		1			
7	1214358-02			DOOR, Cabinet		1			
8	1214360-01			CLIP, Retaining, filter		2			
9	1214361-01			GUIDE, Filter		4			
10	1214362-01			SCREEN		1			
11	1214364-01			STIFFENER		1			
14	311-043			LATCH		2			
16	471-334			SCREW, Flat Head, 6-32 x 1/4 long		2			

1214357A

6.3-17/18



Tape Transport Assembly  
Dwg. No. 1212500-21, -22V  
(Sheet 1 of 2)



Tape Transport Assembly  
Dwg. No. 1212500-21, -22V  
(Sheet 2 of 2)

TAPE TRANSPORT ASSEMBLY				CATALOG NO.	1212500	Sheet 1 of 4	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR CODE	QUANTITY REQUIRED PER VERSION	
						-21	-22
3	1212496-01			CAPSTAN		1	1
6	1212859-01			HANDLE ASSEMBLY, Latch		1	1
9	1213195-07	M1		BLOWER ASSEMBLY		1	1
10	1213195-08	M4		BLOWER ASSEMBLY		1	1
11	1213200-01	RT1, 2		SENSOR ASSEMBLY EOR		2	2
12	1213200-02	RT4, 6		SENSOR ASSEMBLY EOR		2	2
15	1244329-01			BRACKET, Mounting, solenoid head relay		1	1
17	1212620-01			PLATE, Actuator Assembly Head, retractor solenoid		1	1
18	1212774-02			BUSHING, Latch		1	1
19	1212780-01			PAWL, Latch		1	1
20	1212782-01			BAR, Hinge		1	1
22	1212808-03			PIN, Hinge		2	2
23	1213164-02			HEAD COVER		1	1
24	1214630-01			BLOCK, Head Cover Mounting		1	1
33	6000035-01			NAMEPLATE IDENTIFICATION		1	1
34	1213211-01			BLOCK, Spacer		1	1
36	1213213-01			GUIDE PIN		1	1
37	1213214-01			SOCKET, Light, specification		2	2
38	1213215-01			CRANK, Solenoid Reel Emergency Brake		2	2
39	1213216-01			SPACER, Bellcrank Reel Emergency Brake		2	2
40	1213217-01			BELLCRANK, Reel Emergency Brake		2	2
41	1213218-01			SPACER, Pivot, reel emergency brake		4	4
42	1213219-01			CLAMP, Solenoid, brake		2	2
43	1213220-01			MOUNT, Solenoid, parking brake		2	2
44	1213222-01			BLOCK, Hinge		2	2
46	1213404-01			GASKET, Plenum		2	2
47	1213405-01			BRIDGE, Reel Motor Enclosure		2	2
48	1213570-02			BRACKET, Terminal Strip		2	2
49	1213190-03			KEY		2	2
51	1214631-03			LINK, Solenoid Head Retractor		1	1
52	1215385-01			HOSE, Exhaust		2	2
53	1214629-01			PIN, Head Cover		1	1
54	022-130	L1		SOLENOID, Rotary, 25° left throw, 50 vdc		1	1
55	022-133	L3		SOLENOID, Rotary, 25° left, 15 vdc		1	1
56	060-002	DS2, 3		LAMP, Miniature, 28v		2	2
57	060-307	DS1		LAMP, 12v		1	1

1212500V

6. 3-21

## TAPE TRANSPORT ASSEMBLY

CATALOG NO. 1212500

Sheet 2 of 4

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-21	-22
58	180-520			MARKER STRIP		2	2
59	180-432		TB1, 2	TERMINAL BOARD		2	2
60	1240472-03		A1	SOLENOID CONTROL ASSEMBLY		1	1
63	302-130			CLAMP, Cable		2	2
64	352-073			SPRING, 1/4 OD x 1-1/4 long		2	2
65	406-030			PIN, Rollpin, .125 x .625		1	1
66	430-164			RETAINER RING		2	2
67	470-011			SCREW, Socket Cap, 4-40 x 7/16		2	2
68	470-018			SCREW, Socket Cap, 6-32 x 3/8		6	6
69	470-020			SCREW, Socket Cap, 6-32 x 1/2		8	8
71	470-040			SCREW, Socket Cap, 10-32 x 3/4		3	3
72	470-106			SCREW, Socket Cap, 10-32 x 1-1/2		8	2
73	470-042			SCREW, Socket Cap, 10-32 x 1		14	20
74	470-137			SCREW, Socket Cap, 6-32 x 1-1/8		4	4
75	470-407			SCREW, Socket Cap, 3/8-16 x 3/4		11	11
76	471-059			SCREW, Phillips, pan head, 4-40 x 3/16		4	4
78	471-078			SCREW, Phillips, pan head, 8-32 x 3/8		8	8
79	471-334			SCREW, Flat Head, 6-32 x 1/4		3	3
80	472-998			SCREW, Hex Socket, flat head, 10-32 x 1-1/2		4	4
81	477-127			SCREW, Set, cut point, 10-32 x 3/16		2	2
82	477-075			SCREW, Set, flat point, 10-32 x 3/8		6	6
83	477-191			SCREW, Set, oval point, 4-40 x 3/8		2	2
84	477-371			SCREW, Set, flat point, 3/8-24 x 3/8		1	1
85	477-067			SCREW, Set, flat point, 8-32 x 1/4		2	2
86	501-008			WASHER, Flat, #4		14	14
87	501-009			WASHER, Flat, #6		16	16
88	501-011			WASHER, Flat, #10		12	12
89	501-105	Belleville		WASHER		4	4
90	502-002			WASHER, Spring Lock, #4		12	12
91	502-003			WASHER, Spring Lock, #6		22	22
92	502-005			WASHER, Spring Lock, #10		30	30
93	502-043			WASHER, Spring Lock, 3/8 ID		11	11
94	506-016			WASHER, "D"		8	8
95	503-314			WASHER THRUST, .687 OD x .380 ID x .031		2	2
96	471-456			SCREW, Phillips, pan head, 6-32 x 1-3/4		2	2
97	471-073			SCREW, Phillips, pan head, 6-32 x 3/4		8	8

1212500V

6.3-22

## TAPE TRANSPORT ASSEMBLY

CATALOG NO. 1212500

Sheet 3 of 4

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-21	-22
98	471-552			SCREW, Binder Head, 10-32 x 1/2		4	4
99	477-130			SCREW, Set, cone point, 4-40 x 1/8		1	1
100	470-038			SCREW, Socket Cap, 10-32 x 1/2		5	5
101	430-076			RING, Retaining		1	1
102	180-400			CONNECTOR, Block 6 Way		3	3
103	180-395			CONNECTOR, Block 3 Way		30	30
104	180-409			END, Lock		4	4
105	1240798-01			EXTENSION HINGE PIN		2	2
106	18312-02			PLUNGER, Head Cover		2	2
107	471-112			SCREW, Phillips, pan head, #4-40 x 3/8		4	4
108	172-004			LUG, Solder		2	2
109	022-131			SOLENOID, Rotary 25° Right, 50 vdc		1	1
111	310-008			FASTENER, Spring Catch		2	2
112	302-162			CABLE CLAMP, 3/8		3	3
113	302-149			CABLE CLAMP, 1/2		2	2
114	302-078			CABLE CLAMP, 5/8		1	1
116		1214450		SCHEMATIC, Transport	REF	REF	
119	1211507-10			LOGO STRIP		1	1
122	1241538-01			REEL HOLDDOWN ASSEMBLY		2	2
124	1214414-04			MOTOR SWITCHING ASSEMBLY		1	1
127	1212570-08			BASE PLATE		1	1
128	1243022-02	A1, 2		PRINTED WIRING ASSEMBLY, Tape Position Sensor		2	2
129	1243050-01	V1, 2		SOLAR CELL		2	2
130	1243332-01			FILTER PHOTO SENSOR		2	2
131	1243259-03			BRACKET, Lower		1	1
132	1243259-04			BRACKET, Upper		1	1
133	1213210-07			COVER, Photo Sensor		1	1
134	1213210-08			COVER, Photo Sensor		1	1
135	1212748-01			SENSOR TAPE TRANSPORT RT 3.5		2	2
136	280-083			SPACER, 1/4 diameter x 1/2 long x .4.40		2	2
137	470-202			SCREW, Socket Cap, 4-40 x 1/4		4	4
138	471-111			SCREW, Phillips pan head		4	4
139	1243261-01			GASKET		2	2
141	1243979-01			CORD, Assembly, brake		2	2
144	036-091	C204		CAPACITOR, 30 $\mu$ f		1	1
145	032-084			CAP, Capacitor		1	1

1212500V

6.3-23

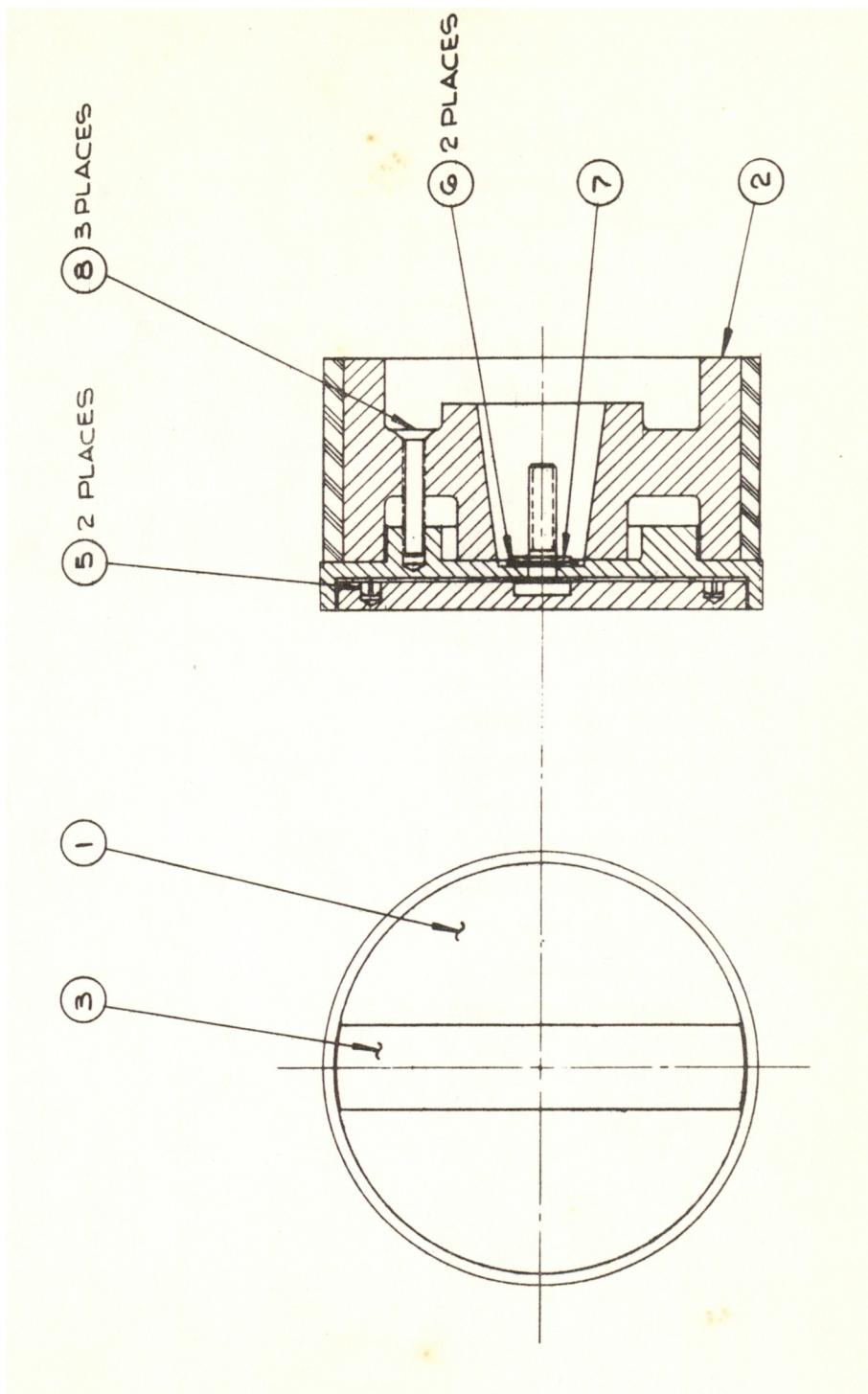
## TAPE TRANSPORT ASSEMBLY

CATALOG NO. 1212500

Sheet 4 of 4

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-21	-22				
146	290-153			BRACKET, Cap, retainer		1	1				
147	470-027			SCREW, Cap, hex, socket head, 8-32 x 3/8		2	2				
148	502-004			WASHER, Lock, split, #8		2	2				
149	501-010			WASHER, Flat, #8		2	2				
152	171-239			TERMINAL LUG, Red, crimp type		2	2				
160	1244323-01			GASKET TRANSITION, Reel Motor		2	2				
162	1244359-01			GASKET RUBBER, Air Pressure Seal		4	4				
165	281-046			HOSE COUPLING		2	2				
166	432-036			O'RING, 5/8 OD x .062 thick		2	2				
167	1213180-09	M3		REEL MOTOR ASSEMBLY		1	1				
168	1213180-10	M2		REEL MOTOR ASSEMBLY		1	1				
170	1212786-07			MOUNTING PLATE, Plenum		1	1				
173	1244344-07			PLENUM ASSEMBLY, 1/2" Top		-	1				
174	1244344-08			PLENUM ASSEMBLY, 1/2" Bottom		-	1				
175	1244618-01			BUTTON ASSEMBLY, Tape Edge Loading		2	2				
176	431-004			RETAINER		2	2				
177	1204868-10			SPRING, Guide Edge Loading		2	2				
178	1213212-03			PANEL, Lamp Mounting		1	1				
179	1244583-02			LAMP SHIELD ASSEMBLY		1	1				
180	1243636-03			AIR FLOW CONTROL VANE		2	2				
181	435-146			CLIP, Fuse Earless		1	1				
182	360-344			TOOL, Vise Pin		1	1				
183	925-002			WIRE, Music, .008 diameter		A/R	A/R				
184	1244330-03			COVER PLENUM		1	1				
185	1244330-04			COVER PLENUM		1	1				
186	1240342-04			CAPSTAN DRIVE ASSEMBLY		1	1				

1212500V



Capstan Assembly  
Dwg. No. 1212496-01D

## CAPSTAN ASSEMBLY

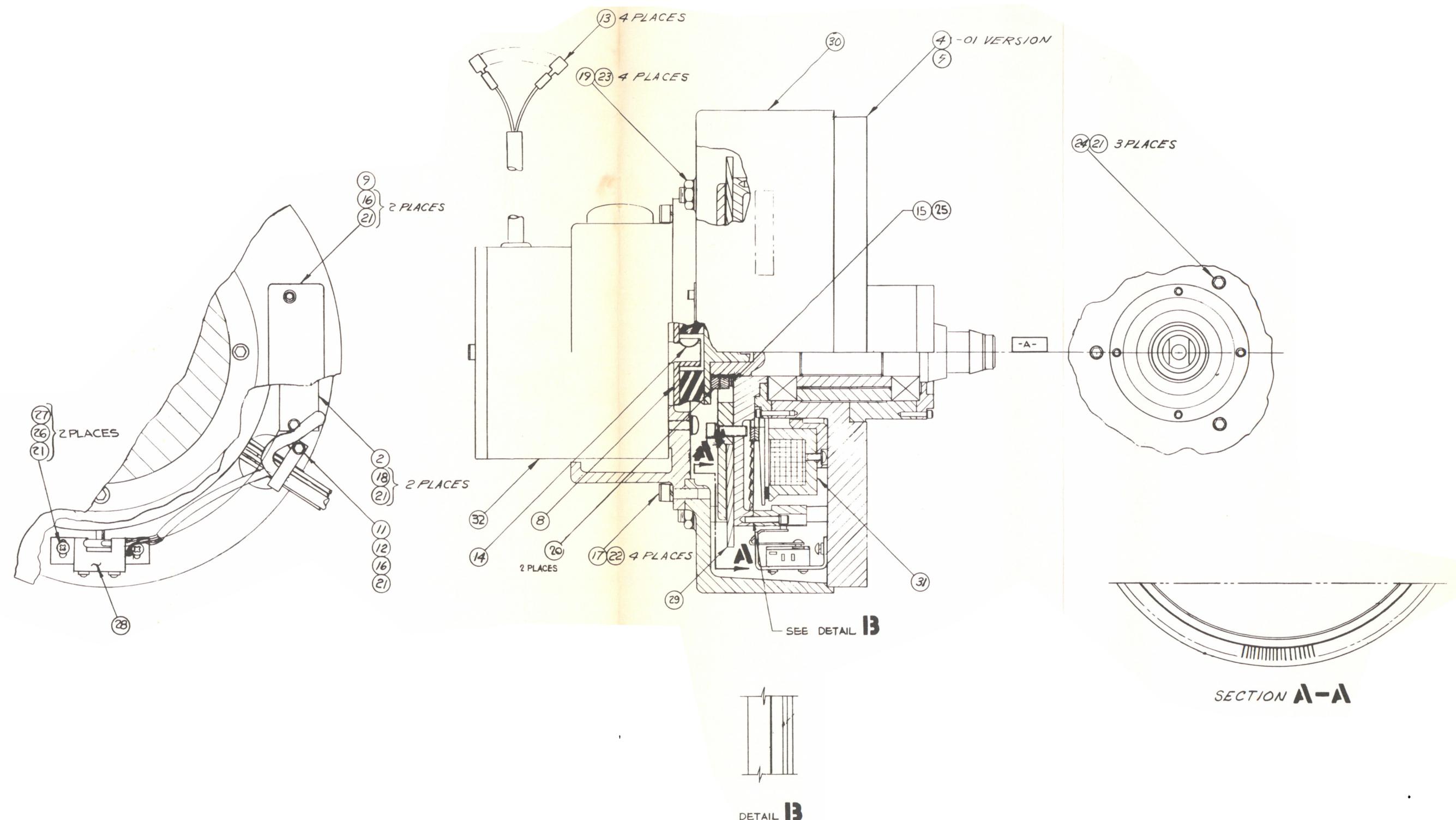
CATALOG NO. 1212496

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-01							
1	1212494-03			CAP, Capstan	1							
2	1212495-02			CAPSTAN	1							
3	1213681-01			BAR, Hold Down Assembly	1							
5	251-096			PLUG BUTTON, Nylon	2							
6	503-021			WASHER, Nylon, 5/16 ID x 5/8 OD	2							
7	430-170			RING, Retaining, 1/4 diameter, external E	1							
8	472-994			SCREW, Machine, flat head, 10-32 x 1 1/8	3							

1212496D

6. 3-27/28

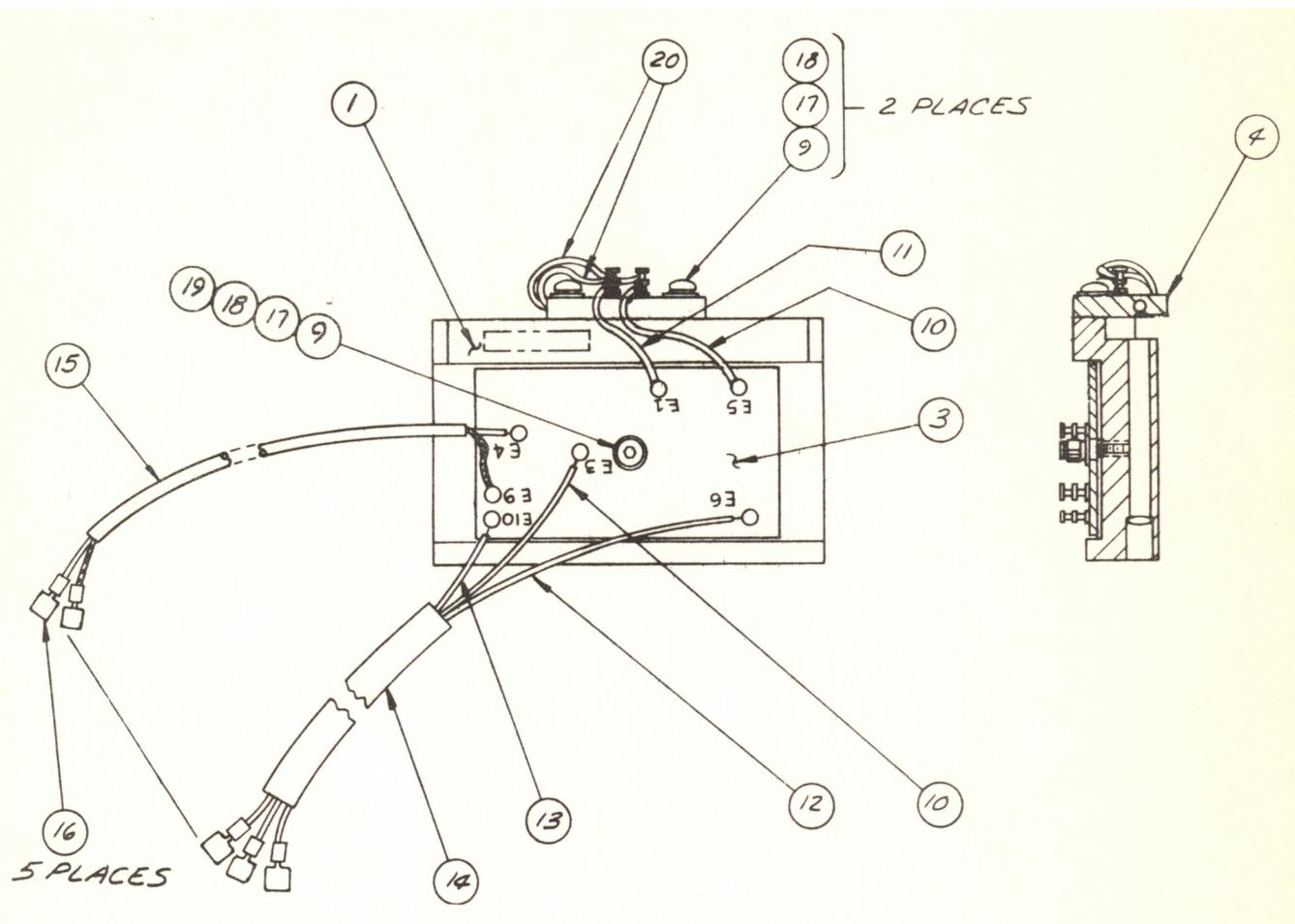


Capstan Drive Assembly  
Dwg. No. 1240342-04J

CAPSTAN DRIVE ASSEMBLY				CATALOG NO. 1240342	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-04					
2	1240316-01			TACHOMETER PHOTOCELL ASSEMBLY		1					
5	1212492-03			CAPSTAN HOUSING ASSEMBLY		1					
8	1212462-03			COUPLING ASSEMBLY		1					
9	1212504-01			COVER		1					
11	1212837-01			PAD, Cable Holddown		1					
12	1212838-02			PLATE, Cable Holddown		1					
13	171-239			TERMINAL LUG		4					
14	435-119			KEY, Woodruff		1					
15	1213671-01			WASHER		1					
16	470-017			SCREW, Cap, hex socket, 6-32 x 5/16		3					
17	470-039			SCREW, Cap, hex socket, 10-32 x 5/8		4					
18	470-408			SCREW, Cap, hex socket, 6-32 x 2-5/8		2					
19	492-012			NUT, Hex, 1/4-20		4					
20	1244278-01			LOCK, Nut, 31/32 - 32, modified		2					
21	502-003			WASHER, Split Lock, #6		10					
22	502-005			WASHER, Split Lock, #10		4					
23	502-006			WASHER, Split Lock, #1/4		4					
24	470-073			SCREW, Cap, hex socket, 6-32 x 3/4		3					
25	1241480-01			WASHER, Felt		1					
26	471-069			SCREW, Machine, pan head, 6-32 x 3/8		2					
27	501-009			WASHER, Flat, #6		2					
28	1244368-01			DIRECTION SWITCH ASSEMBLY		1					
29	1240328-02			TACHOMETER DISC ASSEMBLY		1					
30	1209798-02			BELL HOUSING		1					
31	1240317-02			BRAKE STATOR ASSEMBLY		1					
32	1212503-04			DRIVE MOTOR ASSEMBLY		1					

1240342J

6.3-31/32

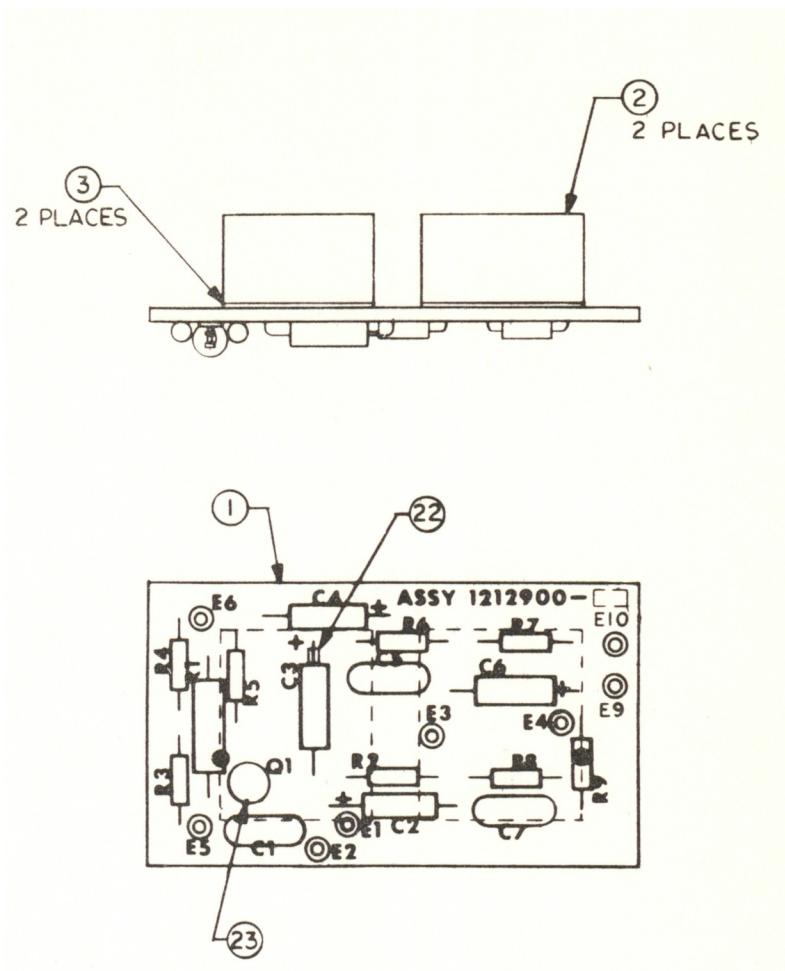


Tachometer Photo Cell Assembly  
Dwg. No. 1240316-01

TACHOMETER PHOTOCELL ASSEMBLY				CATALOG NO.	1240316	Sheet 1 of 1		
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION			
					-01			
1	1240384-01	1214450		SENSOR BLOCK ASSEMBLY	1			
3	1212900-01			TACHOMETER, Preamplifier, printed wiring assembly	1			
4	1240385-01			PHOTOCELL HOLDER ASSEMBLY	1			
9	471-063			SCREW, Pan Head, 4-40 x 7/16 long	3			
10	611-050			WIRE, Insulated, #22, color red	A/R			
11	611-057			WIRE, Insulated, #22, color white	A/R			
12	611-540			WIRE, Insulated, #22, color violet	A/R			
13	611-252			WIRE, Insulated, #22, color black	A/R			
14	600-011			TUBING, Black Electrical Insulated	A/R			
15	90798-10			CABLE, Coaxial	A/R			
16	171-239			TERMINAL, Tab Tongue, 22-16 AWG crimp type	5			
17	502-002			WASHER, Lock, #4, 0.125 ID, 0.212 OD 0.031/0.025	3			
18	501-008			WASHER, Flat, #4, 0.312 OD 0.040/0.025 thick	3			
19	503-010			WASHER, Flat, non-metallic, 0.125 ID x 1/4 OD x 1/32 thick	1			
20	600-037			TUBING, Clear, #20	A/R			
21				SCHEMATIC, Transport	REF			

1240316

6.3-35/36

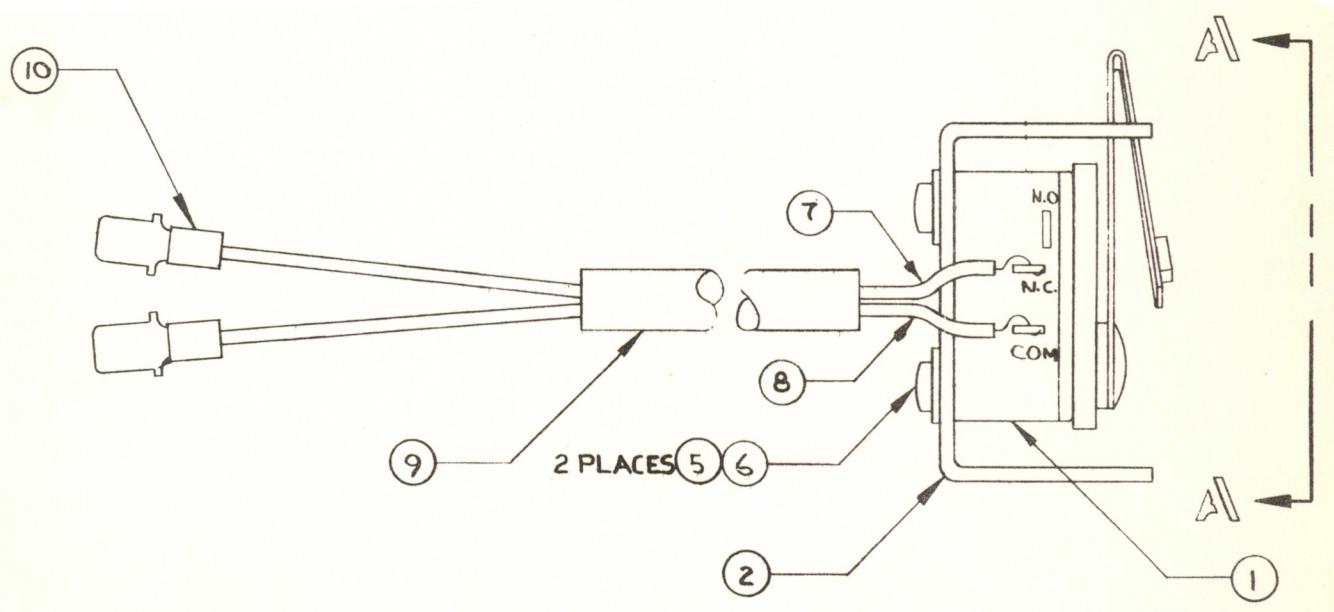
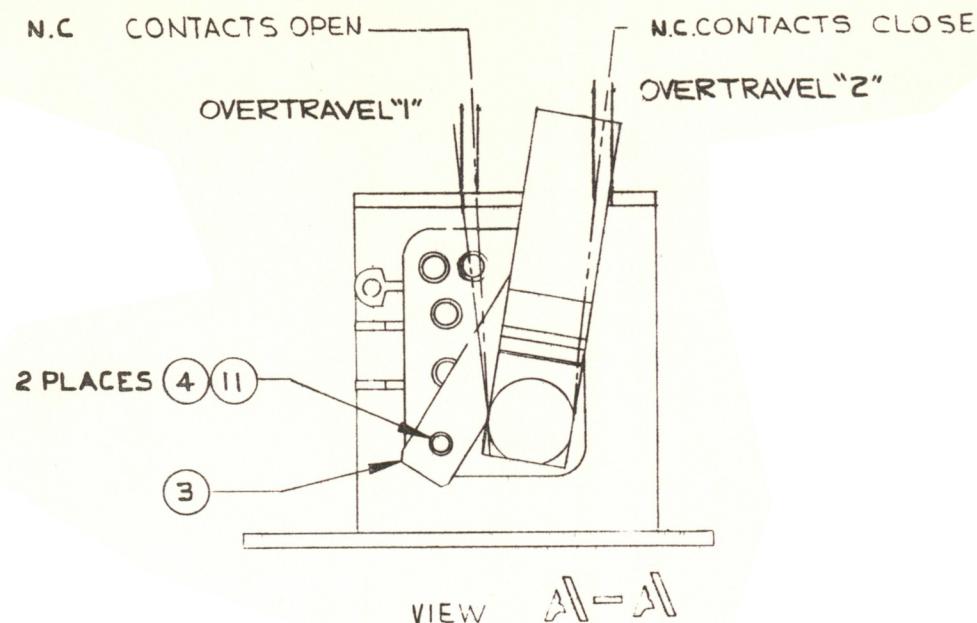


Tachometer Preamplifier Printed Wiring Assembly  
Dwg. No. 1212900-01C

TACHOMETER PREAMPLIFIER PRINTED WIRING ASSEMBLY				CATALOG NO. 1212900	Sheet 1 of 1					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION					
					-01					
1				PRINTED WIRING BOARD	1					
2	1212070-02		A1, 2	OPERATIONAL AMPLIFIER	2					
3	1212074-01			SPACER OPERATION AMPLIFIER	2					
6	014-383		Q1	TRANSISTOR	1					
8	034-181		C5, 7	CAPACITOR, Mica, 47 PF, 500v, 5%	2					
9	034-963		C1	CAPACITOR, Mica, 15 PF, 500v, 5%	1					
10	037-107		C2, 4	CAPACITOR, Tantalum, 2.2 $\mu$ f, 35v, 20%	2					
11	037-216		C3, 6	CAPACITOR, Tantalum, 0.1 $\mu$ f, 35v, 20%	2					
14	041-406		R4	RESISTOR, Fixed, 22 K, 1/4w, 5%	1					
15	041-409		R2	RESISTOR, Fixed, 15 K, 1/4w, 5%	1					
16	041-518		R6, 8	RESISTOR, Fixed, 33 K, 1/4w, 5%	2					
17	041-412		R3	RESISTOR, Fixed, 4700 ohms, 1/4w, 5%	1					
18	041-427		R9	RESISTOR, Fixed, 330 ohms, 1/4w, 5%	1					
19	041-430		R7	RESISTOR, Fixed, 1500 ohms, 1/4w, 5%	1					
20	041-442		R5	RESISTOR, Fixed, 2700 ohms, 1/4w, 5%	1					
21	042-483		R1	RESISTOR, Fixed, 15 K, 1/4w, 1%	1					
23	014-735			SPACER, Transistor	1					
24		1212902		SCHEMATIC	REF					

1212900C

6. 3-39/40



Direction Switch Assembly  
Dwg. No. 1244368-01A

## DIRECTION SWITCH ASSEMBLY

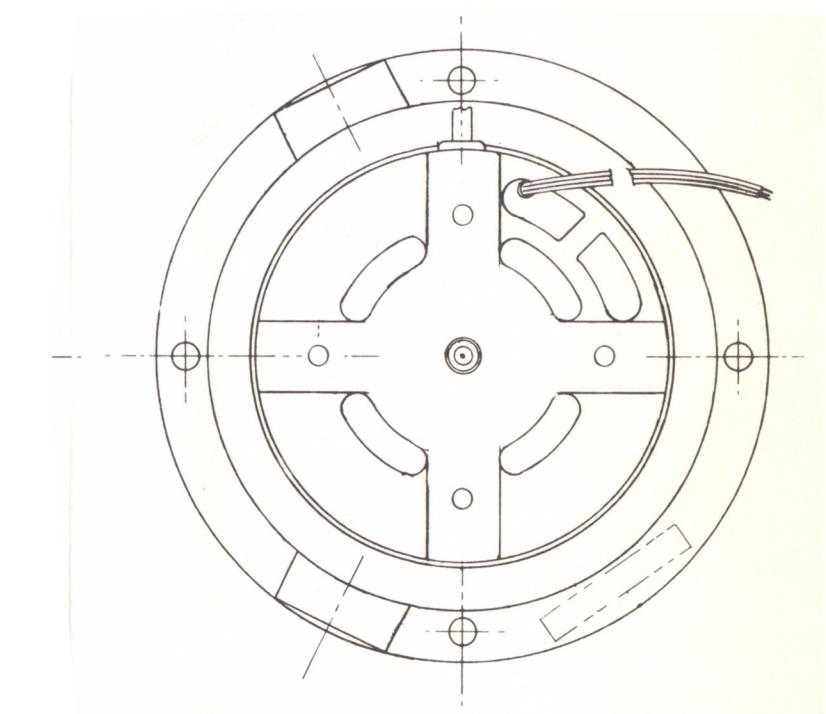
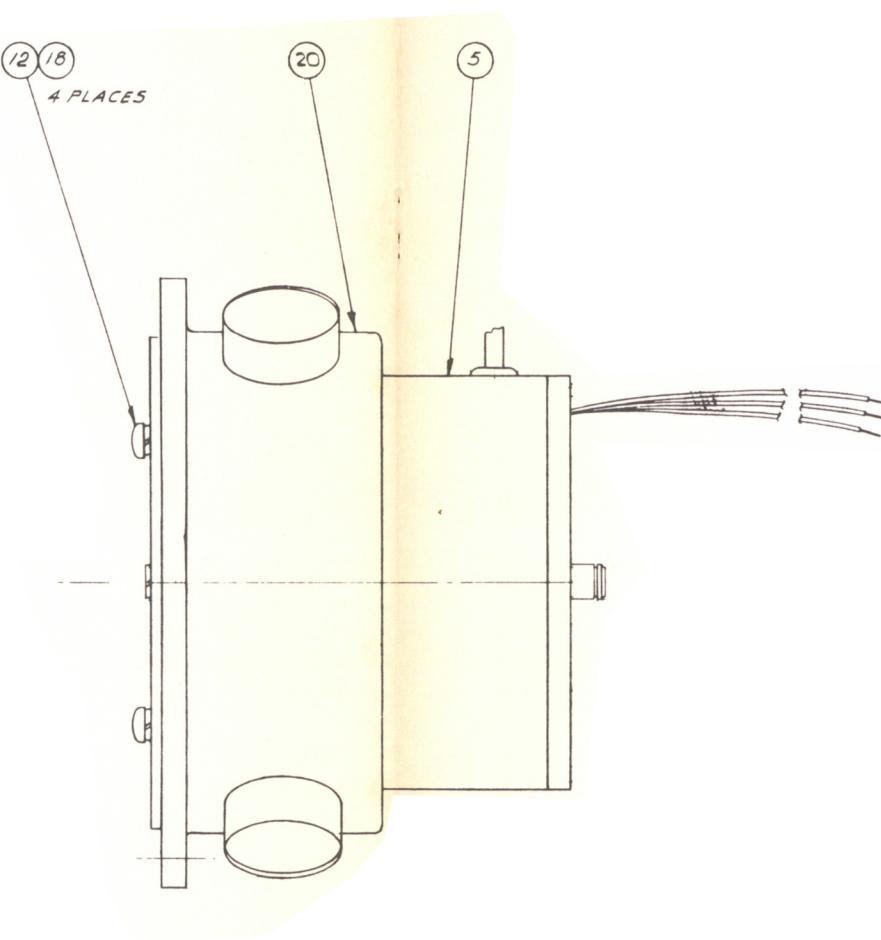
CATALOG NO. 1244368

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-01						
1	1244369-01			SWITCH MODIFICATION		1						
2	1244372-01			BRACKET, Switch		1						
3	1244370-01			NUT PLATE		1						
5	501-008			WASHER, #4		2						
6	471-471			SCREW, Pan Head, 4-40 x 3/4		2						
9	600-011			SLEEVING, Non-metallic, black #6		A/R						
10	171 239			TERMINAL LUG		2						
11	087-255			LOCQUIC CLEANER		A/R						
12		1214450		SCHEMATIC		REF						

1244368

6.3-43/44

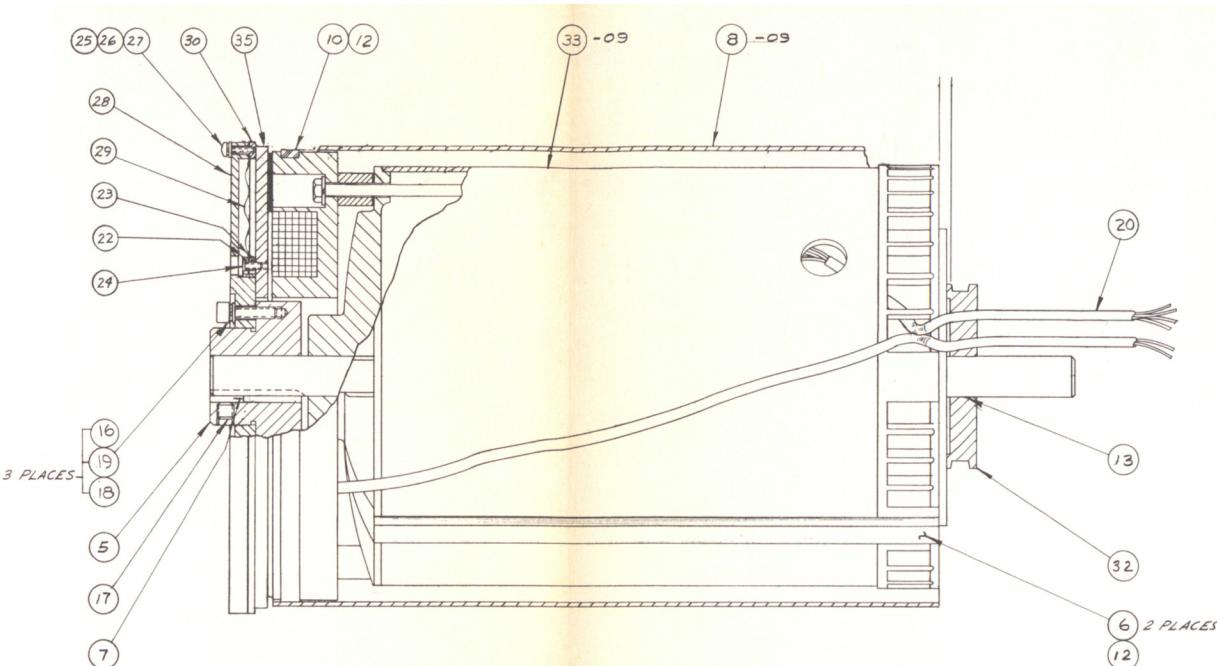


Drive Motor Assembly  
Dwg. No. 1212503-03F

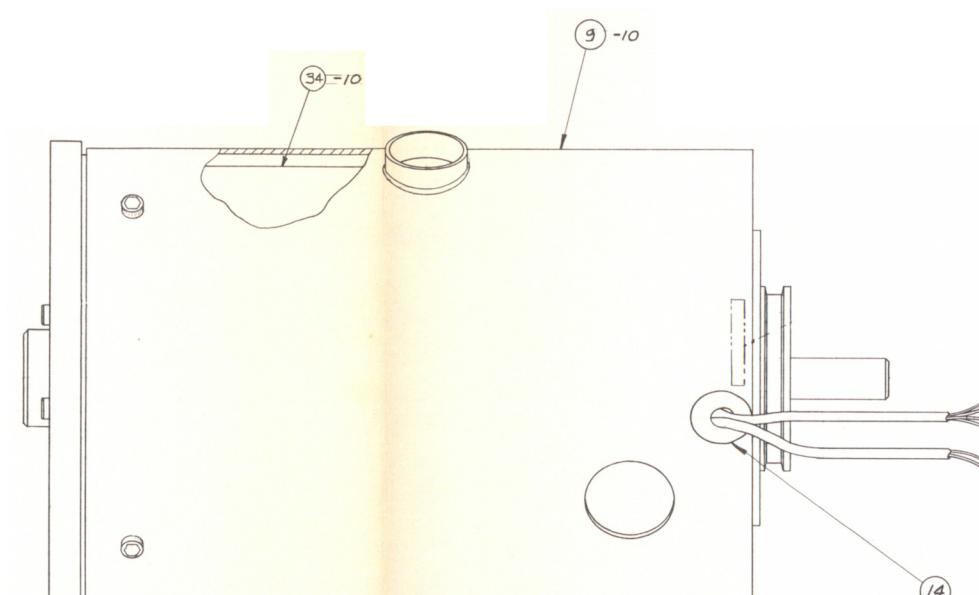
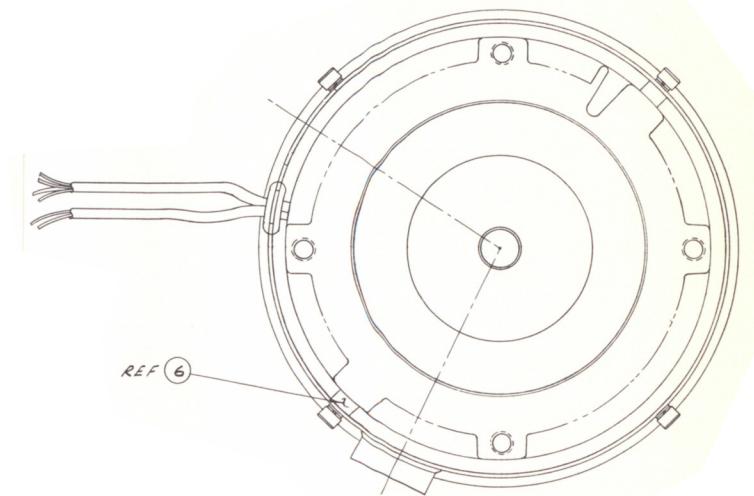
DRIVE MOTOR ASSEMBLY				CATALOG NO. 1212503	Sheet 1 of 1							
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-03							
5	1212502-02			MOTOR CAPSTAN DRIVE	1							
12	472-419			SCREW, Machine, pan head 10-24 x 7/8	4							
18	502-005			WASHER, Spring, lock #10	4							
20	1214267-03			CASTING MODIFIED, Coupling Motor	1							

1212503F

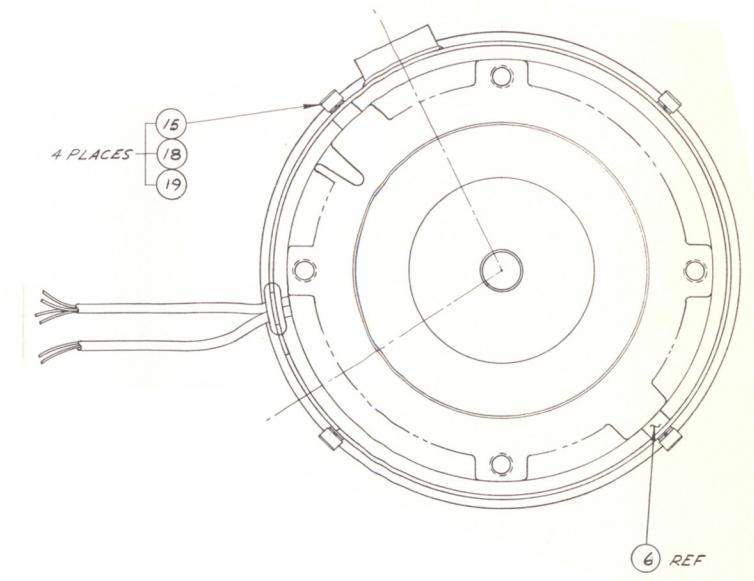
6.3-47/48



-19



-10

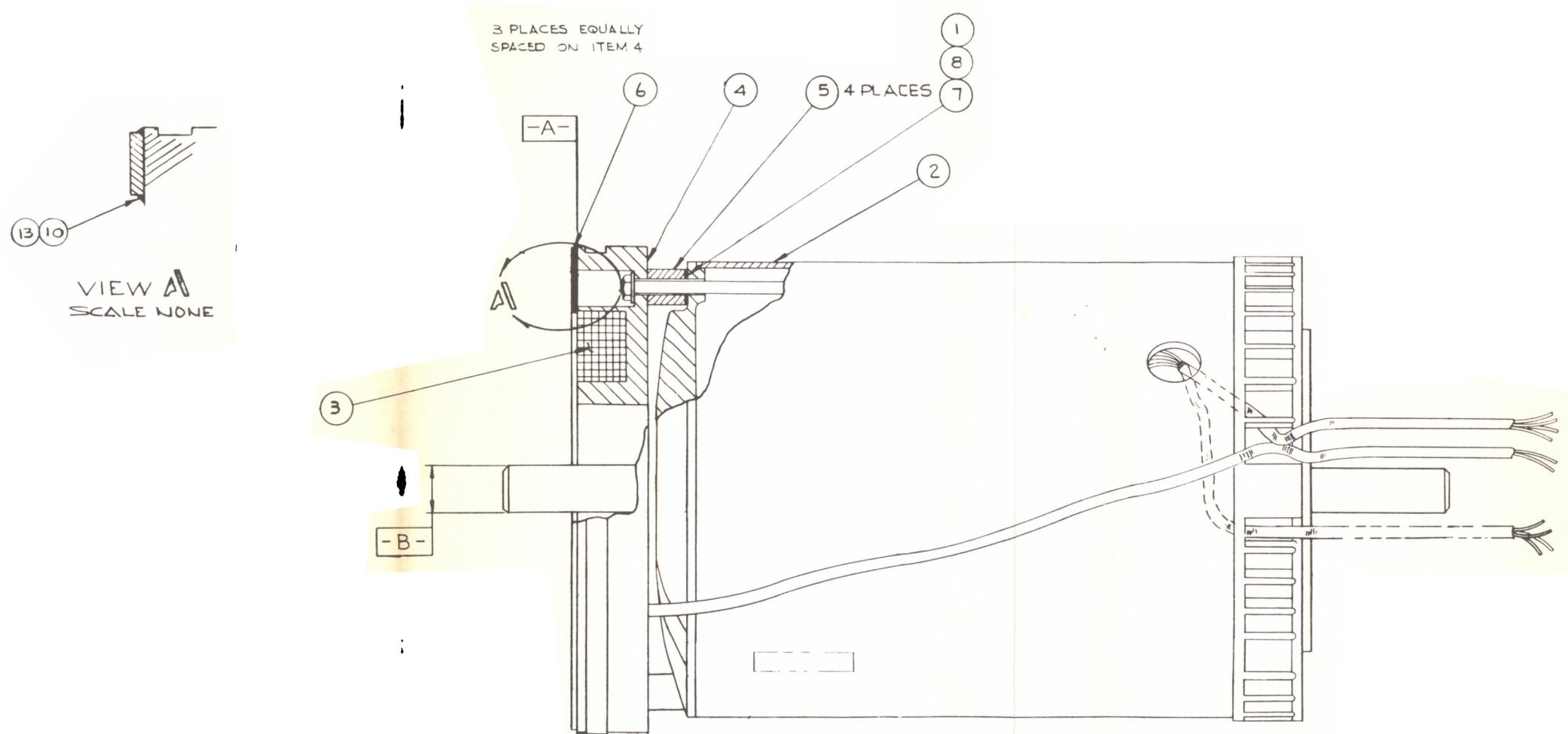


Reel Motor Assembly  
Dwg. No. 1213180-09-10J

REEL MOTOR ASSEMBLY				CATALOG NO. 1213180	Sheet 1 of 1			
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	M.F.R. CODE	QUANTITY REQUIRED PER VERSION		
						-09	-10	
5	1213187-01			HUB, Reel Brake		1	1	
6	1213189-01			BAFFLE		2	2	
7	1213190-02			KEY		1	1	
8	1213232-03			ENCLOSURE, Reel Motor		1	-	
9	1213232-04			ENCLOSURE, Reel Motor		-	1	
10	1213234-01			GASKET		1	1	
14	260-008			GROMMET, .31 ID x .81 OD		1	1	
15	470-036			SCREW, Cap, hex socket, drive, 10-32 x .38		4	4	
16	470-038			SCREW, Cap, hex socket, drive, 10-32 x .50 long		3	3	
17	477-185			SCREW, Set, flat point, 1/4-20 x .25 long		1	1	
18	501-019			WASHER, Flat, #10		7	7	
19	502-005			WASHER, Spring Lock, #10		7	7	
22	1216593-01			RING, Clamping		1	1	
23	1216937-02			SPACER, Diaphragm		1	1	
24	471-326			SCREW, Flat Head, #4-40 x 1/4		12	12	
25	471-062			SCREW, Pan Head, phillips drive, #4-40 x 3/8		12	12	
26	502-002			WASHER, Spring-Lock, #4		12	12	
27	501-008			WASHER, Flat, #4		12	12	
28	1240712-01			COVER, Armature		1	1	
29	1217616-01			DIAPHRAGM		1	1	
30	1240711-01			CLAMP, Diaphragm		1	1	
32	1213185-02			PULLEY, Brake		1	1	
33	1214262-06			MOTOR AND BRAKE ASSEMBLY		1	-	
34	1214262-07			MOTOR AND BRAKE ASSEMBLY		-	1	
35	1213184-03			ARMATURE		1	1	

1213180J

6.3-51/52

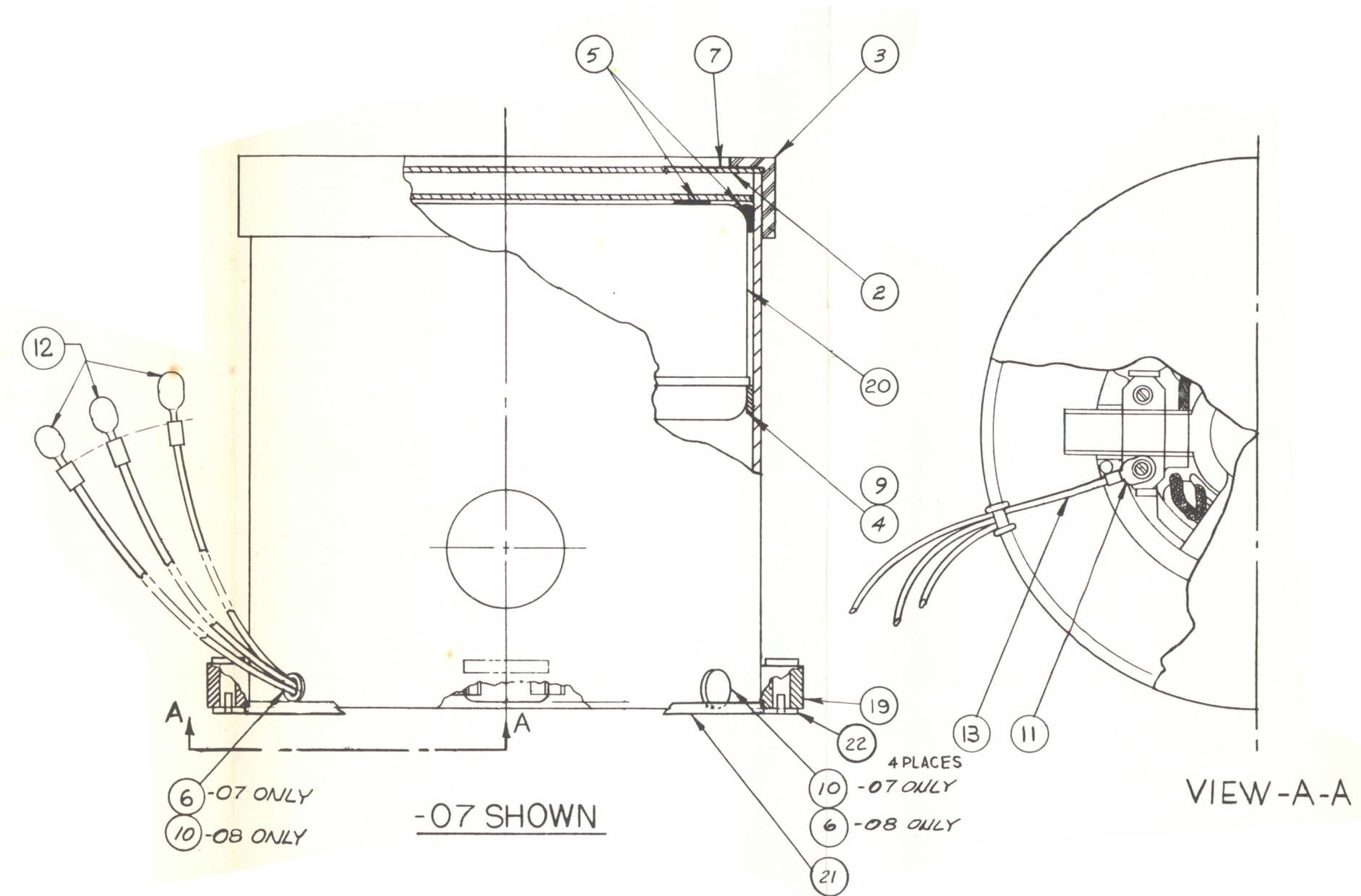


Motor and Brake Assembly  
Dwg. No. 1214262-06-07G

MOTOR & BRAKE ASSEMBLY				CATALOG NO. 1214262	Sheet 1 of 1		
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-06	-07
2	1214263-01			MOTOR		1	1
3	1213025-02			COIL, Reel Brake		1	1
4	1213181-02			HOUSING, Coil		1	1
5	1213186-01			SPACER, Coil, housing		4	4
6	1243887-02			LINING, Reel Brake		1	1

1214262G

6.3-55/56

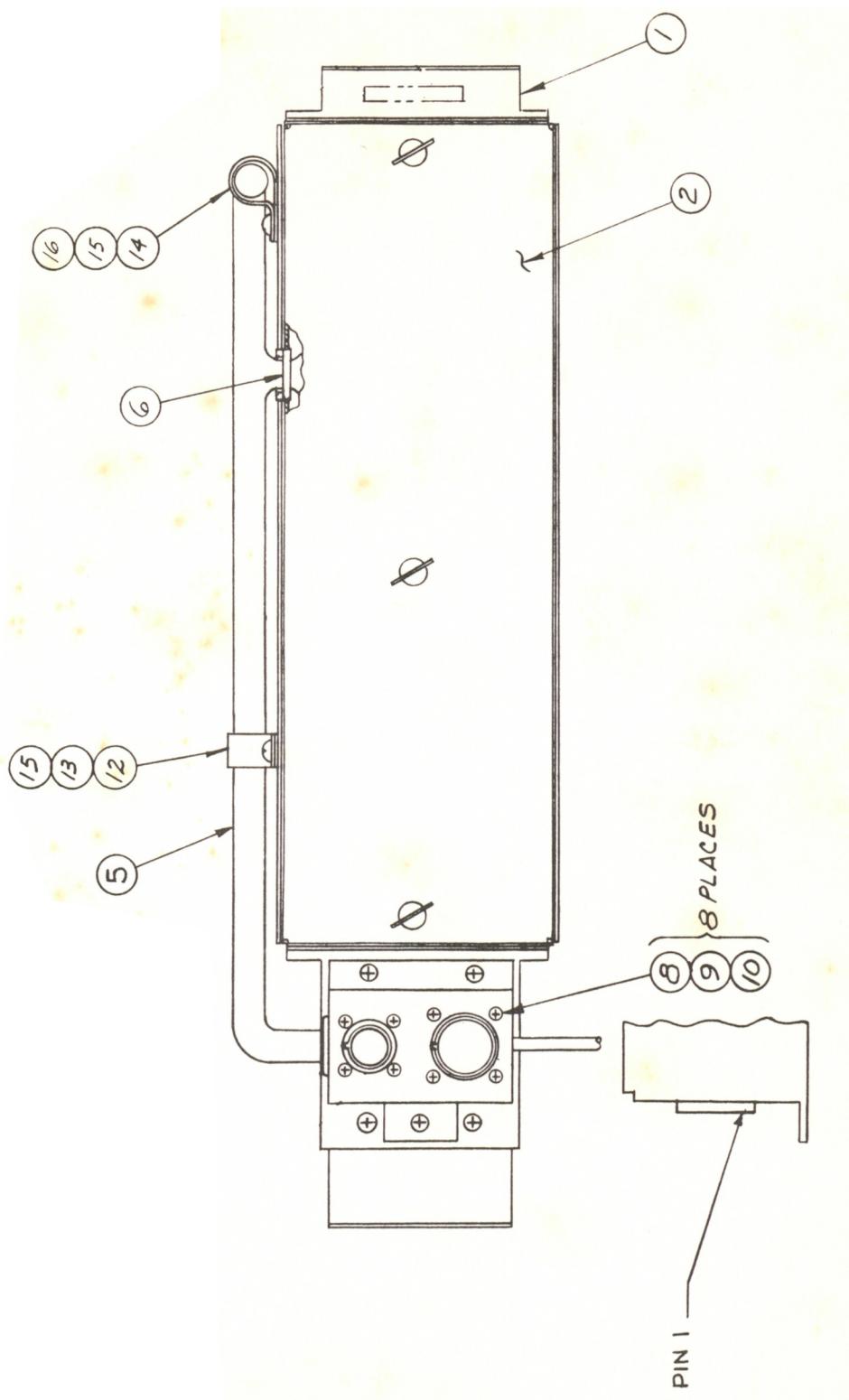


Blower Assembly  
Dwg. No. 1213195-08F

BLOWER ASSEMBLY				CATALOG NO. 1213195	Sheet 1 of 1	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION	
					-07	-08
2	1213197-01			SCREEN FILTER	1	1
3	1212885-01			CAP, Molded	1	1
4	1213234-02			GASKET	1	1
5	018-063			ADHESIVE, Silicone Rubber	A/R	A/R
6	260-019			GROMMET, 3/16 ID	1	1
7	370-002			FILTER PAPER	1	1
9	018-008			ADHESIVE	A/R	A/R
10	251-029			PLUG, Button	1	1
11	172-001			LUG, Terminal	1	1
12	171-239			LUG, Terminal, red, 22-16 AWG	3	3
13	611-162			WIRE, Stranded, black, #16 gauge	A/R	A/R
19	1213196-03			HOUSING, Blower	1	1
20	592-129			VACUUM UNIT MOTOR	1	1
21	1243945-01			GASKET, Seal	A/R	A/R
22	250-047			BUMPER	4	4

1213195F

6. 3-59/60

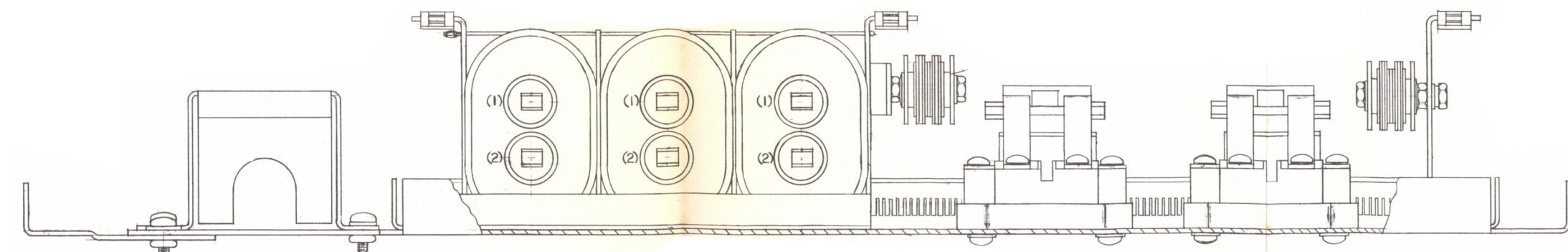
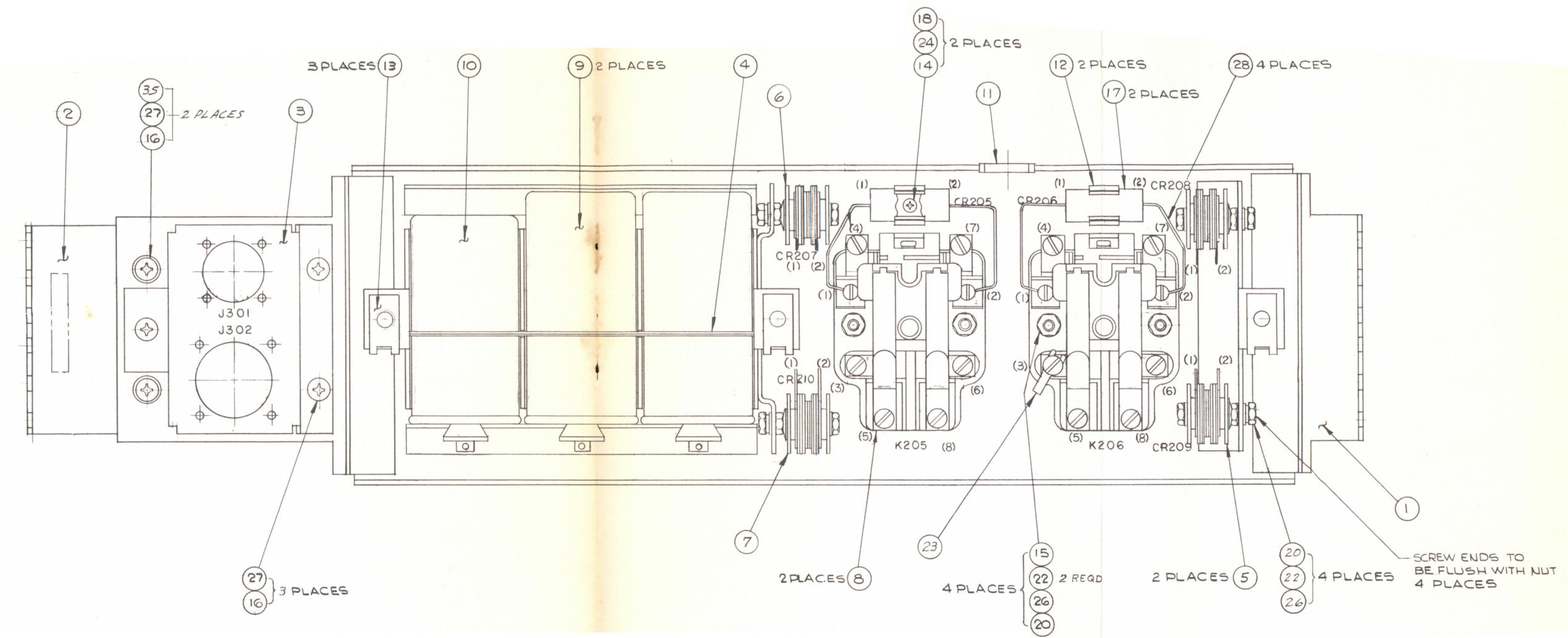


Motor Switch Assembly  
Dwg. No. 1214414-04E

MOTOR SWITCH ASSEMBLY				CATALOG NO. 1214414	Sheet 1 of 1				
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION			
						-04			
1	1213372-02	1214450		RELAY & CAPACITOR ASSEMBLY		1			
2	1213375-02			COVER, Relay & Capacitor Assembly		1			
5	1213673-04			HARNESS TRANSPORT		1			
6	260-058			GROMMET, Caterpillar		A/R			
8	502-002			WASHER, Springlock, #4		8			
9	471-060			SCREW, Pan Head, 4-40 x 1/4 long		8			
10	496-004			NUT, Lock, 4-40		8			
11				SCHEMATIC		REF			
12	302-061			CLIP, Cradle, nylon, .937 diameter		1			
13	302-067			CLIP, Cradle, extensible, 1"		1			
14	302-029			CLAMP, Cable, 3/4 diameter, rubber cushioned		1			
15	471-071			SCREW, Machine, cross, pan head, 6-32 x 1/2 long, steel		2			
16	502-019			WASHER, Lock, flat, external tooth, #6 ID		1			

1214414E

6.3-63/64



Relay and Capacitor Assembly  
Dwg. No. 1213372-02D

## RELAY AND CAPACITOR BRACKET ASSEMBLY

CATALOG NO. 1213372

Sheet 1 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION						
					-02						
1	1214779-02			CHASSIS, Relay and Capacitor	1						
2	1213374-02			CLIP, Extension, chassis	1						
3	1213376-02			BRACKET CONNECTOR MOUNTING	1						
4	1213684-04			PIN, Capacitor Retaining	1						
5	013-685	CR208, 209		DIODE, Voltage Suppressor 25v	2						
6	013-687	CR207		DIODE, Voltage Suppressor 125v	1						
7	013-697	CR210		DIODE, Voltage Suppressor 50v	1						
8	020-427	K205, 206		RELAY, DPDT, 24 vac, 25 amp	2						
9	036-091	C202, 203		CAPACITOR, 30 MFD, 165v	2						
10	036-092	C201		CAPACITOR, 17.5 MFD, 236v	1						
11	260-058			GROMMET, Caterpillar	A/R						
12	435-			CRADLE CLIP, 0.625 diameter x 1/2 long	2						
13	497-031			SPEED NUT, U Type	3						
14	471-060			SCREW, Machine, pan head, phillips drive, 4-40 x 1/4	2						
15	471-082			SCREW, Machine, pan head, phillips drive, 8-32 x 3/4	4						
16	471-089			SCREW, Machine, pan head, phillips drive 10-32 x 1/2	5						
17	013-635	CR205, 206		DIODE, Voltage Suppressor, 25v	2						
18	492-008			NUT, Hex, #4-40	2						
20	492-010			NUT, Hex, #8-32	8						
22	501-010			WASHER, Flat, #8	12						
23	171-004			LUG, Terminal	18						
24	502-002			WASHER, Spring, lock, #4	2						
26	502-004			WASHER, Spring, lock, #8	8						
27	502-005			WASHER, Spring, lock, #10	5						
28	600-036			TUBING, Non-Metallic, teflon	A/R						
29	611-001			WIRE, Insulated, 20 AWG, black	A/R						
30	611-164			WIRE, Insulated, 16 AWG, blue	A/R						
31	611-455			WIRE, Insulated, 16 AWG, white/brown	A/R						
32	611-163			WIRE, Insulated, 16 AWG, green	A/R						
33	611-007			WIRE, Insulated, 20 AWG, blue	A/R						
34	611-286			WIRE, Insulated, 16 AWG, white/black	A/R						
35	501-011			WASHER, Flat, #10	2						

1213372D

6.3-67

RELAY AND CAPACITOR BRACKET ASSEMBLY				CATALOG NO. 1213372	Sheet 2 of 2							
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-02							
36			1214450	SCHEMATIC	REF							
37	611-514			WIRE, Insulated, 16 AWG, orange	A/R							

1213372D

6.3-68

## RELAY AND CAPACITOR COVER ASSEMBLY

CATALOG NO. 1213375

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION									
					-02									
4	310-265			SCREW, Wing Head	3									
5	506-018			WASHER, Retainer	3									

1213375C

6. 3-69/70

## TRANSPORT HARNESS ASSEMBLY

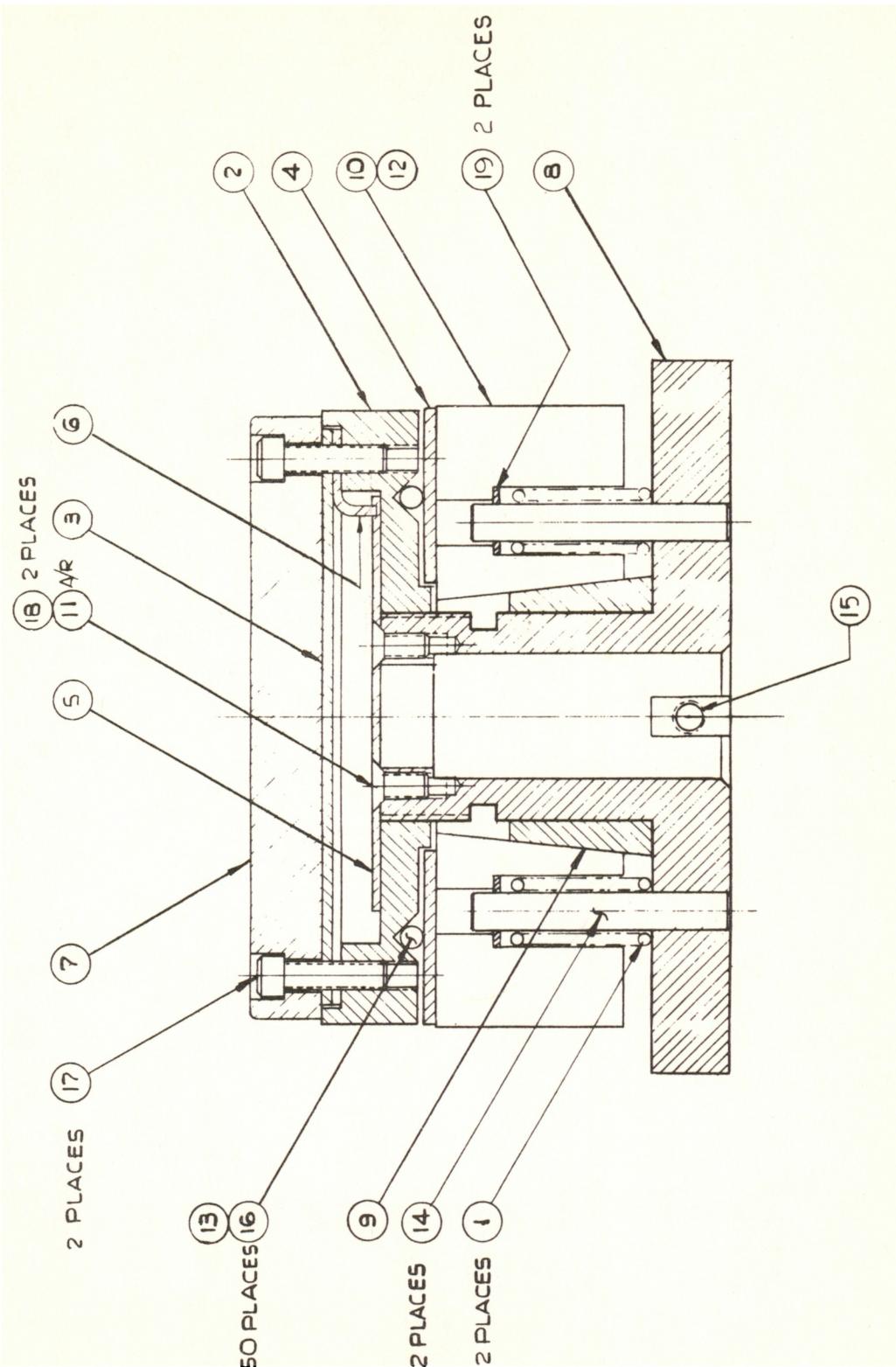
CATALOG NO. 1213673

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-03							
1	146-126		J302	CONNECTOR, Circuit, receptacle 37 socket	1							
2	147-139		J301	CONNECTOR, Circuit, receptacle 7 pins	1							
3	169-136		P2	CONNECTOR, Rectifier, receptacle 3 pins	1							
4	169-149			KEY, Polarizing, connector	1							
5	169-993			CONNECTOR, Contact, pin	2							
7	171-239			TERMINAL LUG, Red	32							
8	172-003			TERMINAL LUG, Internal, #6	2							
9	171-004			TERMINAL LUG	13							
10	260-021			GROMMET, 5/8 ID	1							
53		1214450		SCHEMATIC	REF							
54	169-020		J303	PLUG, Chassis Connector, 3 pin	1							
55	169-019			PIN, Contact Connector	2							

1213673B

6.3-71/72



Reel Holdown Assembly  
Dwg. No. 1241538-01C

## REEL HOLD DOWN ASSEMBLY

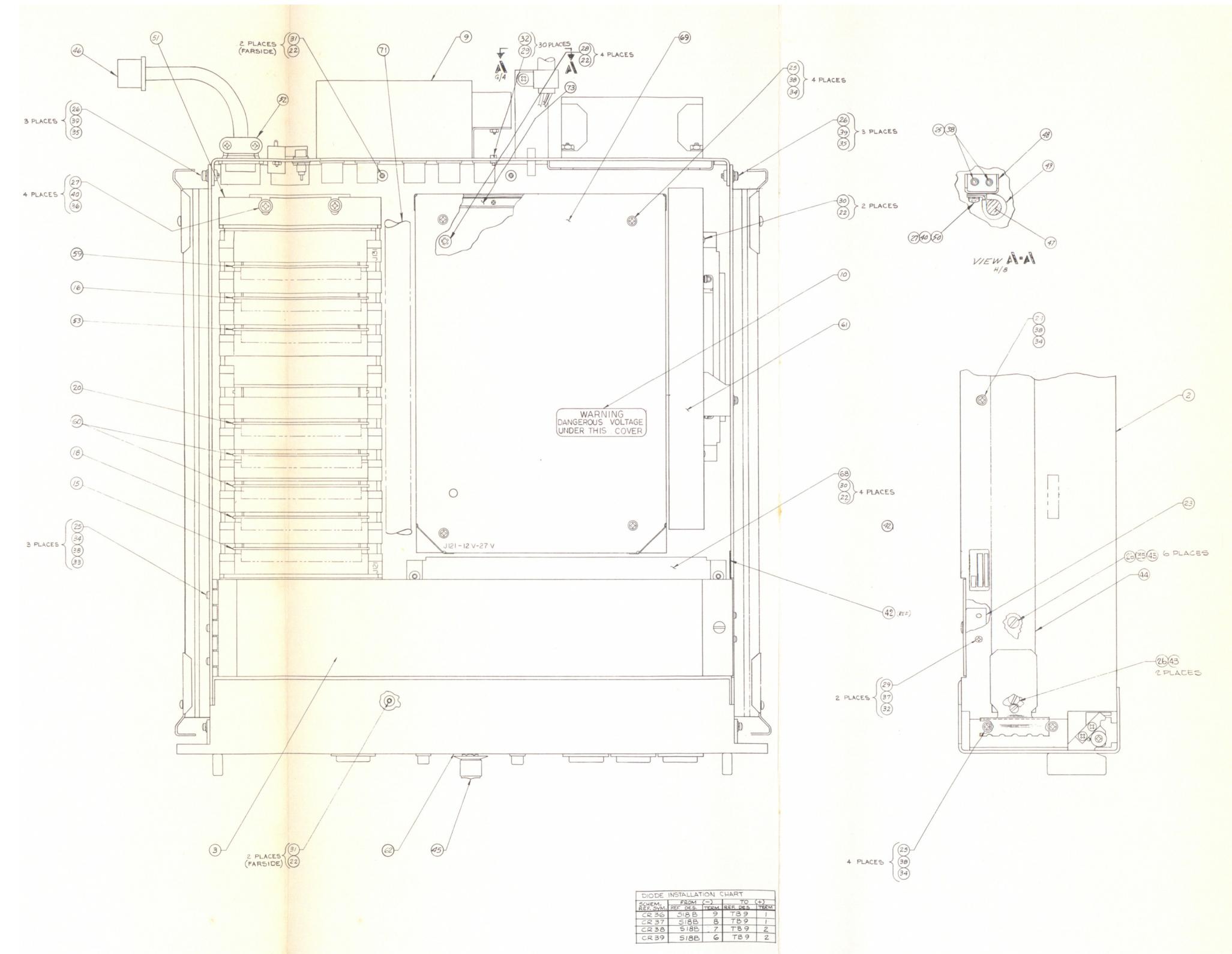
CATALOG NO. 1241538

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-01						
1	1243528-01			SPRING COMPRESSION		2						
2	90045-11			KNOB		1						
3	90046-11			PLATE, Cover		1						
4	90047-10			PLATE, Backup		1						
5	90071-10			PLATE, Indicator		1						
6	90072-11			RING, Stop		1						
7	90075-10			BAR		1						
8	1213451-01			TURNTABLE		1						
9	1241536-01			COLLAR		1						
10	1241537-01			EXPANSION UNIT		1						
14	403-049			PIN, Grooved, 3/16 OD x 1-1/4 long		2						
15	477-075			SCREW, Set, flat point, 10-32 x 3/8		1						
16	420-003			BEARING, Ball, .125 diameter		50						
17	470-166			SCREW, Machine, cap, hex socket, 5-40 x 1/2 long		2						
18	471-327			SCREW, Flat Head, 4-40 x 5/16 long		2						
19	1243529-01			WASHER		2						

1241538C

6.3-75/76



Control Bay Assembly  
Dwg. No. 1212531-08J

CONTROL BAY ASSEMBLY				CATALOG NO. 1212531	Sheet 1 of 2			
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-08		
2	1213029-02			TRAY		1		
3	1213032-02			CONTROL PANEL ASSEMBLY		1		
9	1213322-01			CONNECTOR PANEL ASSEMBLY		1		
10	1213679-01			LABEL		1		
15	1212591-04		J121	PRINTED WIRING BOARD, Regulated Power Supply, -12v, -27v		1		
16	1212597-08		J129	PRINTED WIRING BOARD, Phase Comparator		1		
18	1212874-01		J122	PRINTED WIRING BOARD, Regulated Power Supply, +10v, +12v		1		
20	1213110-03		J125	PRINTED WIRING BOARD, Control Circuit Optics		1		
23	310-050			RECEPTACLE, Side Mounting		1		
24	471-067			SCREW, Machine, pan head, #6-32 x 1/4		1		
25	471-069			SCREW, Machine, pan head, #6-32 x 3/8		13		
26	471-078			SCREW, Machine, pan head, #8-32 x 3/8		14		
27	471-087			SCREW, Machine, pan head, #10-32 x 3/8		5		
28	471-308			SCREW, Machine, flat head, #1/4-20 x 3/8		4		
29	471-111			SCREW, Machine, pan head, #4-40 x 5/16		30		
30	471-334			SCREW, Machine, flat head, #6-32 x 1/4		6		
31	471-344			SCREW, Machine, flat head, #8-32 x 5/16		4		
32	492-008			NUT, Hex, #4		30		
33	492-009			NUT, Hex, #6		3		
34	501-009			WASHER, Flat, #6		12		
35	501-010			WASHER, Flat, #8		12		
36	501-011			WASHER, Flat, #10		4		
37	502-002			WASHER, Split Lock, #4		2		
38	502-003			WASHER, Split Lock, #6		14		
39	502-004			WASHER, Split Lock, #8		6		
40	502-005			WASHER, Split Lock, #10		5		
42	6000035-01			NAME PLATE		1		
43	496-006			NUT, 8-32, keps		8		
44	290-130			SLIDE, Kit, right & left hand		1		
45	6000009-10			KNOB, 1-1/2" Grey, #1		1		
46	143-162			CONNECTOR		1		
47	084-026			CORD SET, Power		1		

1212531U

6. 3-79

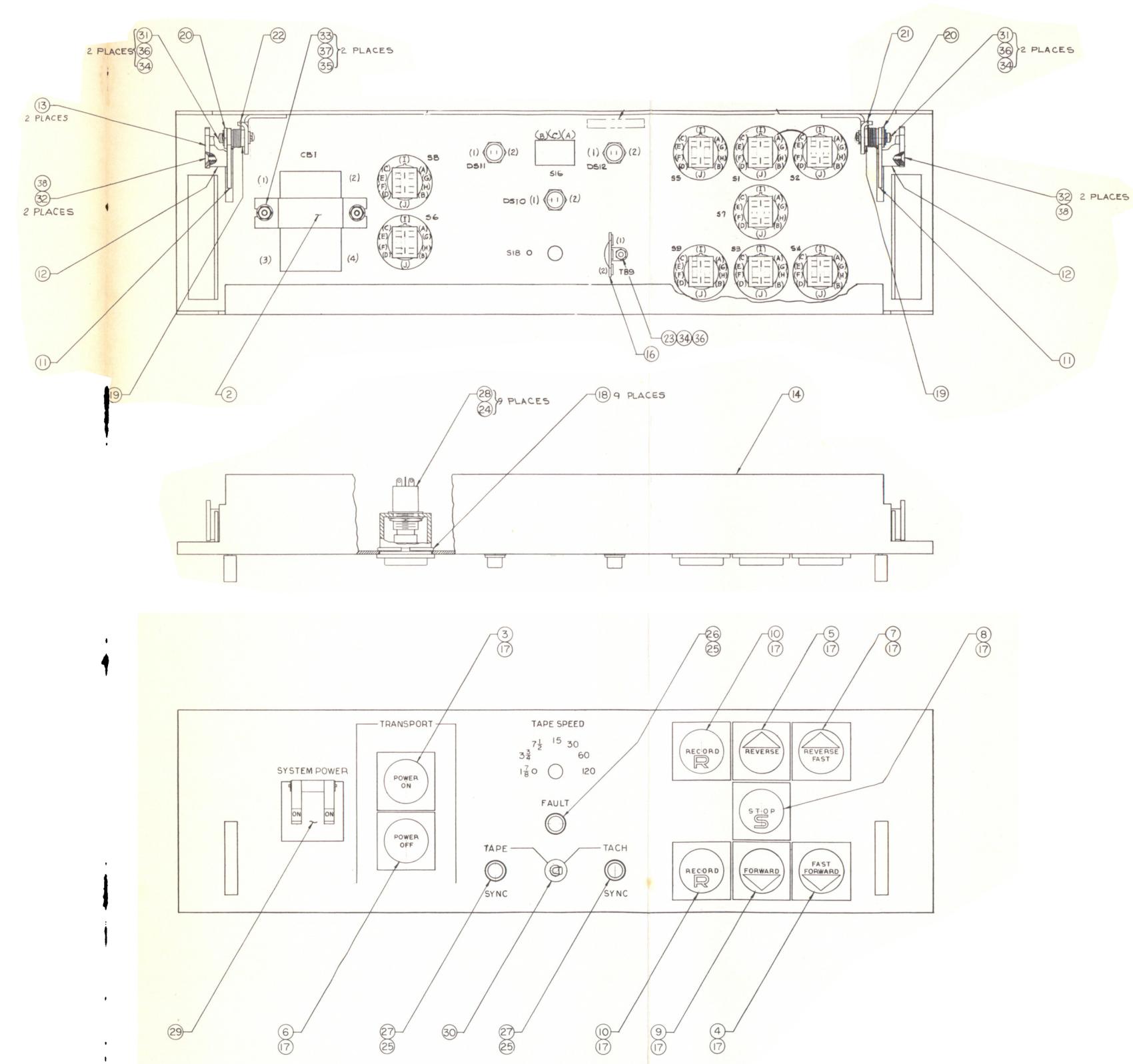
## CONTROL BAY ASSEMBLY

CATALOG NO. 1212531

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-08						
48	1217116-01			BRACKET, Clamp		1						
49	302-021			CLAMP, Cable, 9/16		1						
50	492-011			NUT, Hex, #10-32		1						
51	1214537-02			CARD RACK ASSEMBLY		1						
52	302-010			CLAMP, Cable		1						
53	1212290-10	J128		FREQUENCY DIVIDER ASSEMBLY		1						
57		1214292		SCHEMATIC		REF						
59	1241344-02	J130		PRINTED WIRING ASSEMBLY, Capstan Servo Compensator & Brake Amplifier		1						
60	1240452-03	J123, 124		PRINTED WIRING BOARD, Reel Servo		2						
61	1241500-02			HEAT SINK ASSEMBLY		1						
62	1213028-02			FRONT PANEL ASSEMBLY		1						
68	1213038-03			RELAY CHASSIS ASSEMBLY		1						
69	1213053-03			COVER ASSEMBLY		1						
71	1214453-05			HARNESS, Control Bay		1						
73	1213046-07			POWER SUPPLY ASSEMBLY		1						

1212531U



Front Panel Assembly  
Dwg. No. 1213028-02F

FRONT PANEL ASSEMBLY				CATALOG NO.	1213028	Sheet 1 of 2		
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-02		
2	1213056-01			BRACKET CIRCUIT BREAKER		1		
3	1213378-01			PUSHBUTTON ASSEMBLY, Power On		1		
4	1213378-02			PUSHBUTTON ASSEMBLY, Fast Forward		1		
5	1213378-03			PUSHBUTTON ASSEMBLY, Reverse		1		
6	1213378-04			PUSHBUTTON ASSEMBLY, Power Off		1		
7	1213378-05		4	PUSHBUTTON ASSEMBLY, Reverse Fast		1		
8	1203656-20			PUSHBUTTON, Stop		1		
9	1203656-50			PUSHBUTTON, Forward		1		
10	1203656-10			PUSHBUTTON, Record		2		
11	1213034-01			LATCH ASSEMBLY, Modified		2		
12	1213035-02			SPACER		2		
13	1217132-03			LATCH, Right Hand		2		
14	1213030-03			PANEL, Front		1		
16	180-021	TB9		TERMINAL STRIP		1		
17	91652-01			ESCUTCHEON		9		
18	91659-10			RING, Retaining		9		
19	91817-10			SPACER, Latch Pivot		2		
20	91818-10			BUSHING, Latch Pivot		2		
21	91819-30			SPRING, Left Hand		1		
22	91819-40			SPRING, Right Hand		1		
23	492-009			NUT, #6-32		1		
24	060-019			LAMP		9		
25	060-070			LAMP		3		
26	132-083	DS10		LAMP ASSEMBLY		1		
27	132-084	DS11, 12		LAMP ASSEMBLY		2		
28	120-487	S1 thru S9		SWITCH PUSHBUTTON		9		
29	126-127	CB1		SWITCH, Circuit Breaker		1		
30	120-501	S19		SWITCH TOGGLE		1		
31	471-069			SCREW, Machine, pan head, 6-32 x 3/8		4		
32	471-339			SCREW, Machine, flat head, 6-32 x 5/8		4		
33	492-010			NUT, Hex, #8		2		
34	501-009			WASHER, Flat, #6		5		
35	501-010			WASHER, Flat, #8		5		
36	502-003			WASHER, Split Lock, #6		4		

## FRONT PANEL ASSEMBLY

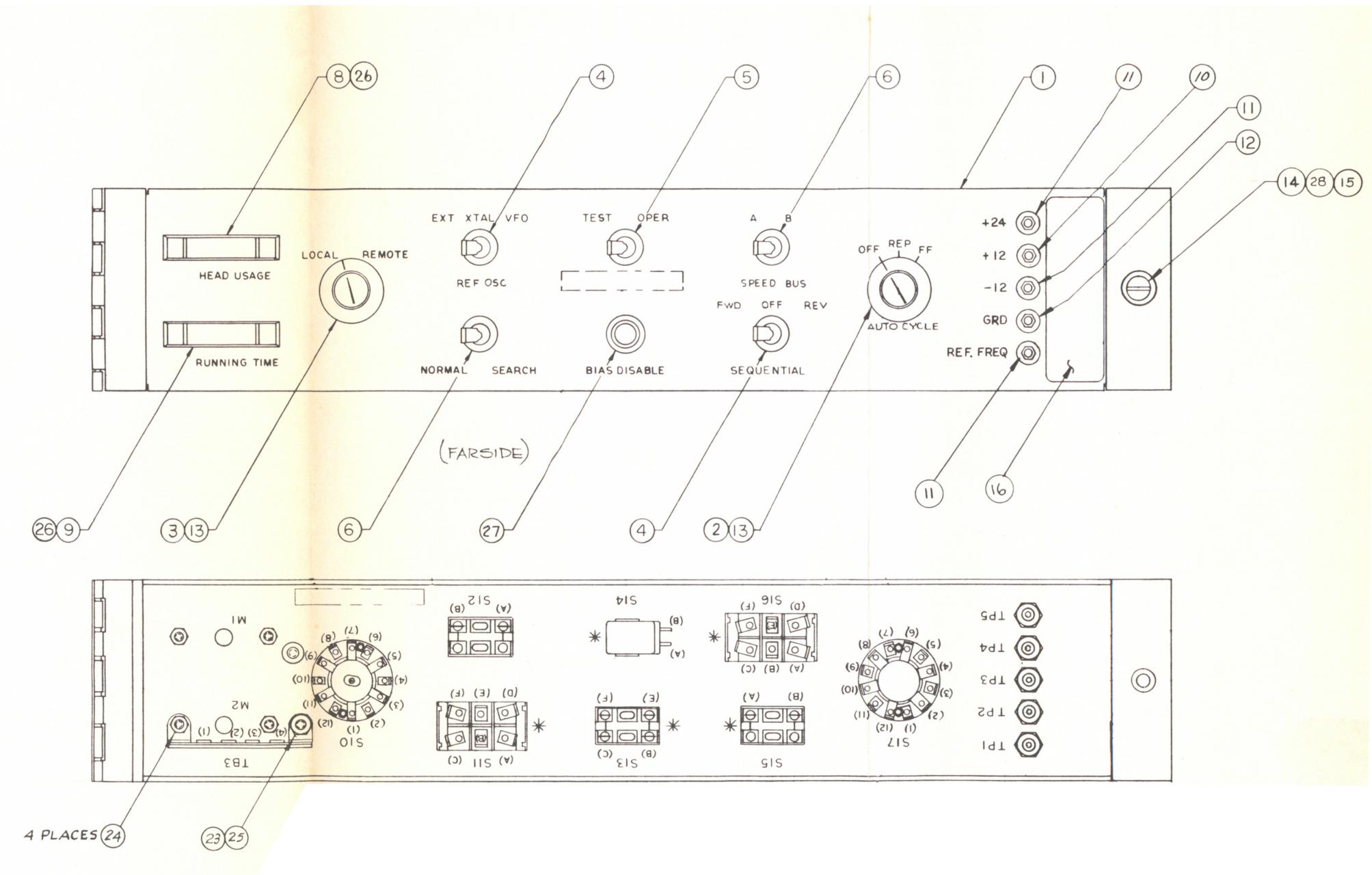
CATALOG NO. 1213028

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	M.F.R. CODE	QUANTITY REQUIRED PER VERSION						
						-02						
37	502-004			WASHER, Split Lock, #8		2						
44		1214292		SCHEMATIC, Control Bay		REF						

1213028F

6.3-84

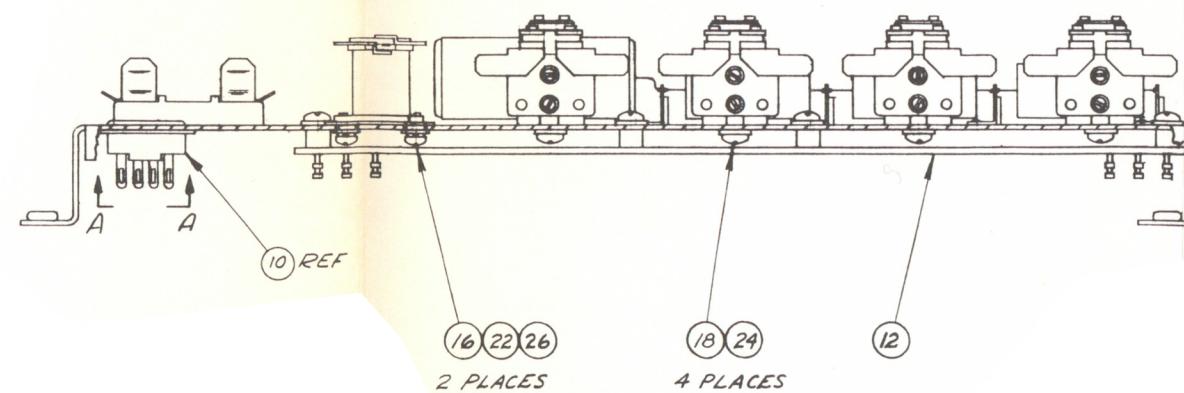
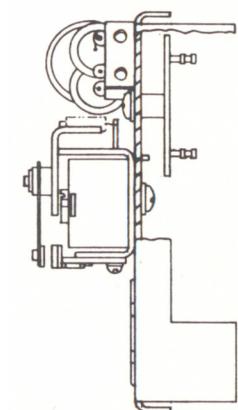
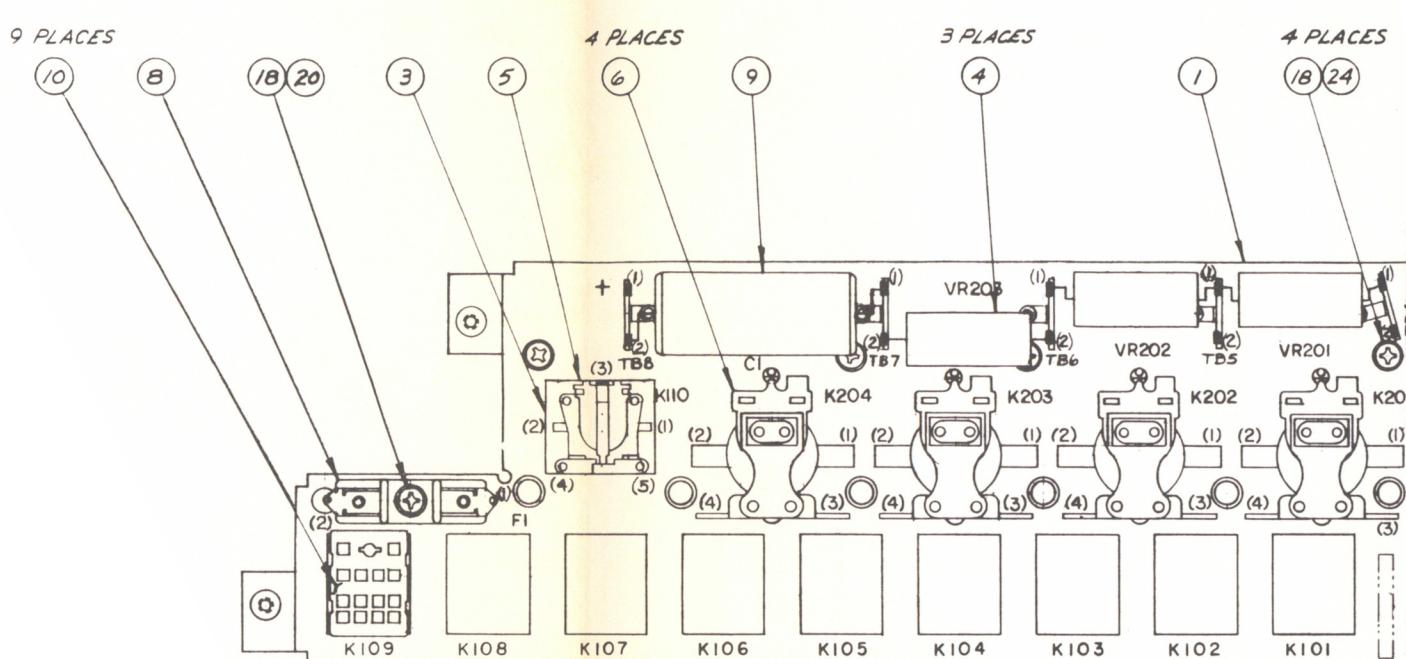


Control Panel Assembly  
Dwg. No. 1213032-02C

CONTROL PANEL ASSEMBLY				CATALOG NO. 1213032	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION						
					-02						
1	1213033-01			PANEL, Control	1						
2	1213694-01	S17		SWITCH, Rotary	1						
3	1213693-01	S10		SWITCH, Rotary	1						
4	120-502	S11, 16		SWITCH, Toggle, 2P3P	2						
5	120-503	S13		SWITCH, Toggle, DPST	1						
6	120-501	S12, 15		SWITCH, Toggle, SPST	2						
8	090-095	M2		METER, Elapsed Time, head usage	1						
9	090-094	M1		METER, Elapsed Time, running time	1						
10	148-018	TP1, 2		TEST POINT, Red	1						
11	148-022	TP3, 5		TEST POINT, Blue	3						
12	148-019	TP4		TEST POINT, Black	1						
13	6000006-10			KNOB, Skirted, "5/8 series for 1/4" shaft	2						
14	310-061			FASTENER, Oval Head	1						
15	310-204			RETAINER, Split Ring	1						
16	1213679-01			LABEL, Voltage Caution	1						
17	172-182			TERMINAL BOARD, 4 Terminals	1						
20	615-002			WIRE, Bare, solid, #22 AWG	A/R						
21		1214292		SCHEMATIC	REF						
22	1214472			CONTROL PANEL JUMPER LIST	REF						
23	492-009			NUT, Hex, #6	1						
24	502-002			WASHER, Lock, #4	4						
25	502-003			WASHER, Lock, #6	1						
26	271-007			LENS	2						
27	120-523	S14		SWITCH, Push Button	1						
28	503-030			WASHER, Nylon, 1/4 ID x 1/2 OD x 1/32 thick	1						

1213032C

6.3-87/88



1	2	3	4
5	6	7	8
9	10	11	12
13			14

VIEW A-A  
(K101 THRU K109)

Relay Chassis Assembly  
Dwg. No. 1213038-03G

## RELAY CHASSIS ASSEMBLY

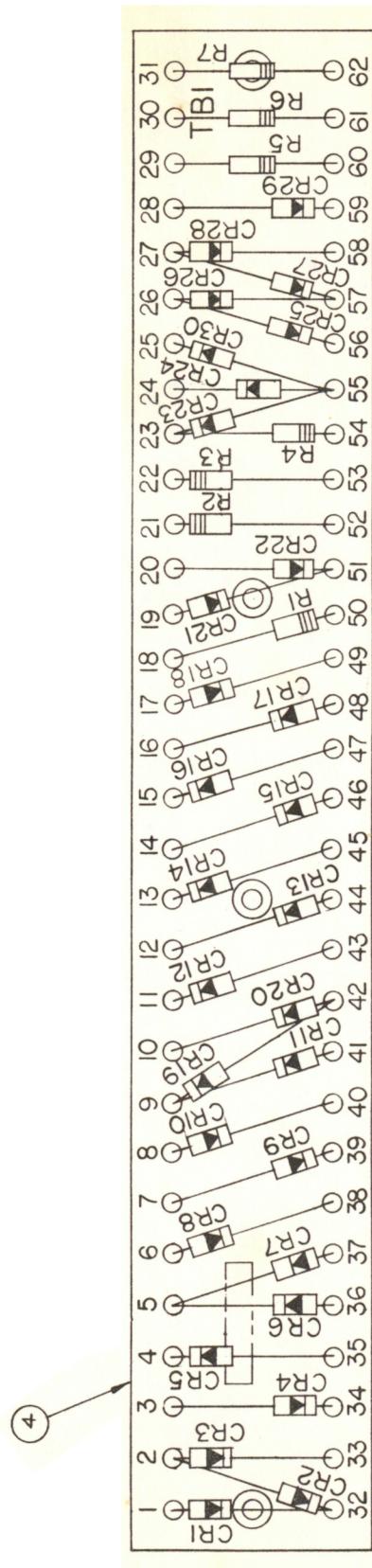
CATALOG NO. 1213038

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-03						
1	1213039-02			BRACKET, Relay Mounting		1						
3	1213327-01			INSULATOR		1						
4	013-635	VR201- 203		DIODE, Voltage Suppressor		3						
5	020-426	K110		RELAY, SPST		1						
6	020-428	K201- 204		RELAY		4						
7	070-031	F1		FUSE, Fast Blow, 3/4a, 250v		1						
8	130-004			MOUNT, Fuse		1						
9	031-454	C1		CAPACITOR, 1000 $\mu$ f, 35v		1						
10	150-992			SOCKET, Relay		9						
11	020-144	K101-109		RELAY, 4P2T, 650 ohms, 24v		9						
12	1213325-04	TB1		TERMINAL BOARD ASSEMBLY		1						
16	471-060			SCREW, Pan Head, 4-40 x 1/4		2						
18	471-069			SCREW, Pan Head, 6-32 x 3/8		9						
20	496-002			NUT, 6-32		1						
22	502-013			LOCKWASHER, #4, external		2						
24	502-014			LOCKWASHER, #6, external		8						
26	503-016			INSULATOR		2						
34		1214292		SCHEMATIC	REF							

1213038G

6.3-91/92

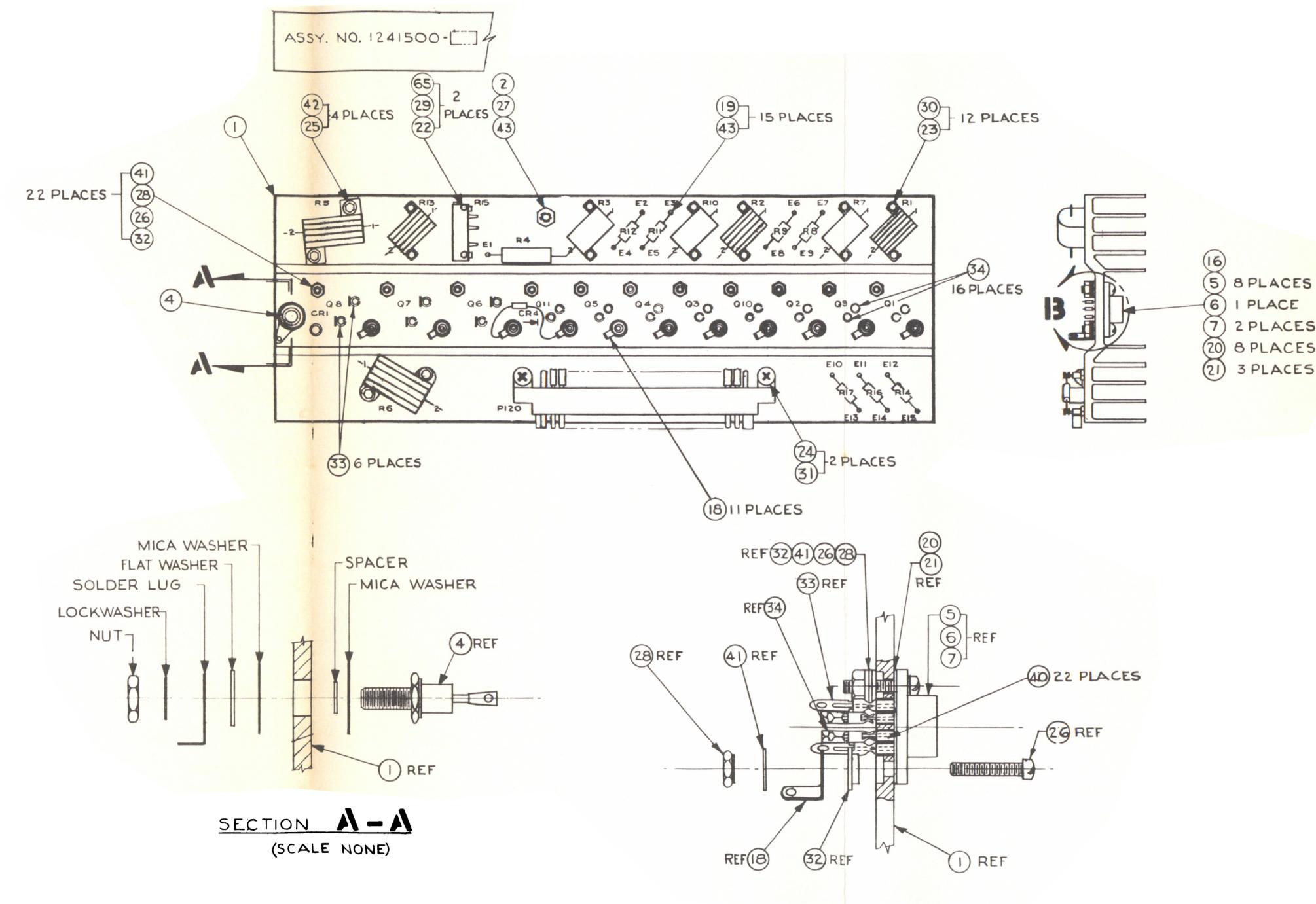


Terminal Board Assembly  
Dwg. No. 1213325-04E

TERMINAL BOARD ASSEMBLY				CATALOG NO. 1213325	Sheet 1 of 1					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION				
						-04				
2	041-003		R2	RESISTOR, Fixed, composition, 100 ohms, 1/2w, 5%		1				
3	041-008		R3	RESISTOR, Fixed, composition, 1.5K ohms, 1/2w, 5%		1				
4	1213040-01			BOARD TERMINAL		1				
5	057-194		R1	RESISTOR, Carbon Film, 4.75 megohms, 1/2 watt, 1%		1				
6	057-207		R4	RESISTOR, Carbon Film, 9.53 megohms, 1/2 watt, 1%		1				
13	041-245		R5-7	RESISTOR, Fixed, composition, 1000 ohms, 1/2w, 5%		3				
15			1214292	SCHEMATIC		REF				
17	013-678	CD 451	CR1-30	DIODE		30				

1213325E

6.3-95/96



DETAIL B  
ASSEMBLY ITEMS 5, 6, AND 7  
AS SHOWN  
(SCALE NONE)

**Heat Sink Assembly**

HEAT SINK ASSEMBLY				CATALOG NO. 1241500	Sheet 1 of 2					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION				
						-02				
1	1240999-02			PLATE, Heat Sink		1				
2	1241515-01			SPACER		1				
3	013-678	CD 451	CR4	DIODE, Silicon		1				
4	013-684	CD 440	CR1	DIODE, Silicon		1				
5	014-587		Q1-5, 9-11	TRANSISTOR		8				
6	014-660	CD506	Q6	TRANSISTOR		1				
7	014-630	CD526	Q7, 8	TRANSISTOR		2				
9	043-214	CD388	R4	RESISTOR, Fixed, wirewound, 50 ohms, 5w, 3%		1				
11	047-879	CD389	R1, 2	RESISTOR, Fixed, wirewound, 1.5 ohms, 10w, 3%		2				
12	047-881	CD390	R5	RESISTOR, Fixed, wirewound, .5 ohms, 25w, 3%		1				
13	047-880		R6	RESISTOR, Fixed, wirewound, 1.0 ohms, 25w, 3%		1				
14	058-056		R15	RESISTOR, Adj., wirewound, 1/2w, 500 ohms, 10%		1				
15	047-738		R13	RESISTOR, Fixed, wirewound, 10 ohms, 10w, 3%		1				
17	143-084		P120	CONNECTOR, Printed Circuit Plug, 24 pins		1				
18	172-013			TERMINAL, Lug, solder, plain, #6		11				
19	173-384		E1-15	TERMINAL, Feed Thru, insulated, 4-40 stud		15				
20	267-045			MOUNTING PAD, Transistor		8				
21	014-676			MOUNTING PAD, Transistor		3				
22	473-148			SCREW, Machine, slotted, phillips head, #0-80 x 7/16		2				
23	470-002			SCREW, Cap, hex-socket, 2-56 x 1/4		12				
24	471-069			SCREW, Machine, cross-recessed, pan head, 6-32 x 3/8		2				
25	470-009			SCREW, Cap, hex-socket, 4-40 x 5/16		4				
26	471-071			SCREW, Machine, cross-recessed, pan head, 6-32 x 1/2		22				
27	477-063			SCREW, Set, flat point, hex-socket, 6-32 x 3/8		1				
28	496-005			NUT, Keps, #6-32		22				
29	501-150			WASHER, Flat #0, stainless steel		2				
30	502-001			WASHER, Lock Spring, #2		12				
32	503-322			WASHER, Shoulder, #8		22				
33	169-976			CONTACT, Socket, female, pin		6				
34	171-215			CONNECTOR, Solderless, pin		16				

1241500C

## HEAT SINK ASSEMBLY

CATALOG NO. 1241500

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-02						
35	041-004		R14	RESISTOR, Fixed, carbon composition, 220 ohms, 1/2w, 5%		1						
36	043-342		R3	RESISTOR, Fixed, wirewound, 5 ohms, 10w, 3%		1						
37	043-417		R7, 10	RESISTOR, Composition, 50 ohms, 10w, 3%		2						
38	041-331		R8, 11	RESISTOR, Composition, 3300 ohms, 1/2w, 5%		2						
39	041-336		R17, 9, 12, 16	RESISTOR, Composition, 470 ohms, 1/2w, 5%		4						
40	600-023			SLEEVING, #17, black		22						
41	501-009			WASHER, Flat #6		22						
42	502-002			WASHER, Lock Spring, #4		4						
43	018-081			ADHESIVE, Loctite, grade H		A/R						
64			1241574	SCHEMATIC DIAGRAM		REF						
65	502-096			WASHER, Lock, split, #0		2						

1241500C

6.3-100

## HEAT SINK BASE ASSEMBLY

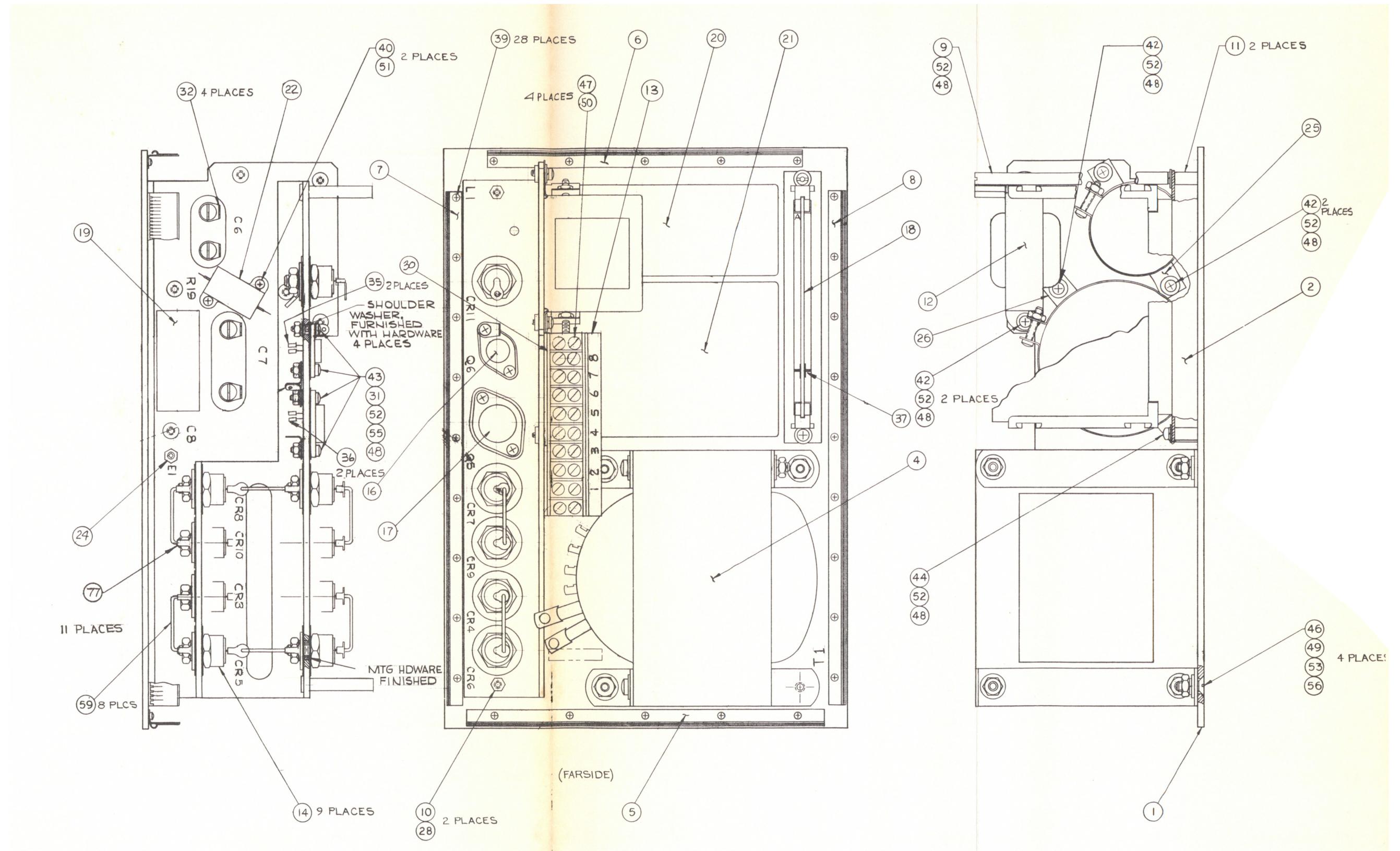
CATALOG NO. 1213043

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-01							
1	1213044-01			BASE, Heat Sink	1							
2	1213045-01			PIN, Guide	2							
3	143-085			CONNECTOR	1							
4	471-071			SCREW, Phillips Head, 6-32 x 1/2 long	2							
5	501-009			WASHER, Flat, #6	2							
6	502-014			WASHER, Lock, #6	4							
7	471-069			SCREW, Phillips Head, 6-32 x 3/8 long	2							

1213043A

6.3-101/102



Power Supply Assembly  
Dwg. No. 1213046-07J

POWER SUPPLY ASSEMBLY				CATALOG NO.	1213046	Sheet 1 of 2					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-07					
1	1213047-03			PLATE		1					
2	1213202-02			CONNECTOR BASE ASSEMBLY		1					
4	1213051-01	T1		TRANSFORMER		1					
5	1213050-01			ANGLE, Top		1					
6	1213080-01			ANGLE, Bottom		1					
7	1213081-01			ANGLE		1					
8	1213081-02			ANGLE		1					
9	1213049-01			SPACER, Round		1					
10	1213048-01			SPACER, Hex		2					
11	1213318-01			SPACER		2					
12	1213319-02		L1	INDUCTOR, Specification		1					
13	180-507			MARKING STRIP		1					
14	013-979	CR3-11		DIODE		9					
16	014-587		Q6	TRANSISTOR		1					
17	014-660		Q5	TRANSISTOR		1					
18	1212731-05			REGULATOR POWER SUPPLY, +24v Printed Wiring Assembly		1					
19	031-454		C8	CAPACITOR		1					
20	031-948		C6	CAPACITOR		1					
21	031-301		C7	CAPACITOR		1					
22	047-748		R19	RESISTOR, 0.25 ohms, 25 watt, 3%		1					
24	173-397		E1	TERMINAL, Standoff		1					
25	290-080			BRACKET, Capacitor		1					
26	290-088			CLAMP, Capacitor		1					
30	180-051	TB2		TERMINAL STRIP		1					
31	172-003			LUG, Solder, #6		4					
32	172-009			LUG, Solder, #10		4					
35	171-215		REF Q6	CONNECTOR, Solderless		2					
36	169-976		REF Q5	CONTACT, Socket, electron tube		2					
37	169-318			KEY, Polarizing		1					
39	471-866			SCREW, Machine, pan head, #2-56 x 1/8		28					
40	471-002			SCREW, Machine, pan head, #2-56 x 3/16		2					
42	471-069			SCREW, Machine, cross recessed, pan head, 6-32 x 3/8		6					
43	471-070			SCREW, Machine, pan head, 6-32 x 7/16		4					
44	471-073			SCREW, Machine, pan head, 6-32 x 3/4		1					
46	471-356			SCREW, Machine, flat head, #10-32 x 1/2		4					
47	471-063			SCREW, Machine, pan head, 4-40 x 7/16		4					

1213046J

6.3-105

## POWER SUPPLY ASSEMBLY

CATALOG NO. 1213046

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-07						
48	501-009			WASHER, Flat, #6		12						
49	501-011			WASHER, Flat, #10		4						
50	502-002			WASHER, Lock Split, #4		4						
51	502-001			WASHER, Lock Split, #2		2						
52	502-003			WASHER, Lock Split, #6		12						
53	502-005			WASHER, Lock Split #10		4						
55	492-009			NUT, Hex, #6		4						
56	492-011			NUT, Hex, #10		4						
60		1212728		SCHEMATIC		REF						
77	173-160			CONNECTOR, Solderless		11						

1213046J

6.3-106

## CONNECTOR BASE ASSEMBLY

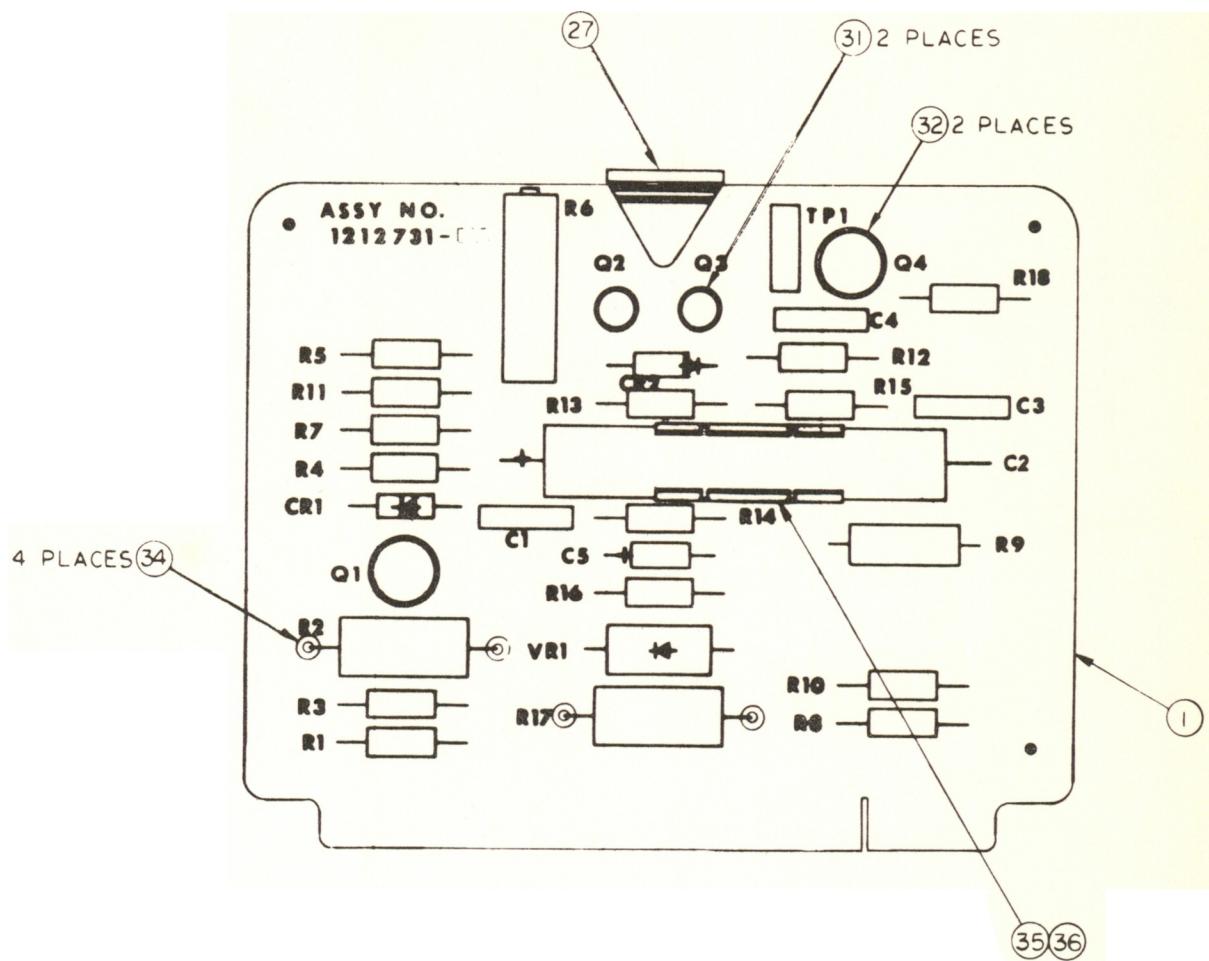
CATALOG NO. 1213202

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-02							
1	1213059-01			BASE, Card, printed wiring	1							
2	168-081			CONNECTOR, Receptacle, 22 pin	1							
3	169-605			GUIDE, Card	2							
5	471-064			SCREW, Machine, pan head, 4-40 x 1/2	2							
6	501-136			WASHER, Flat, #4	2							
7	502-002			WASHER, Lock, split, #4	2							

1213202A

6. 3-107/108

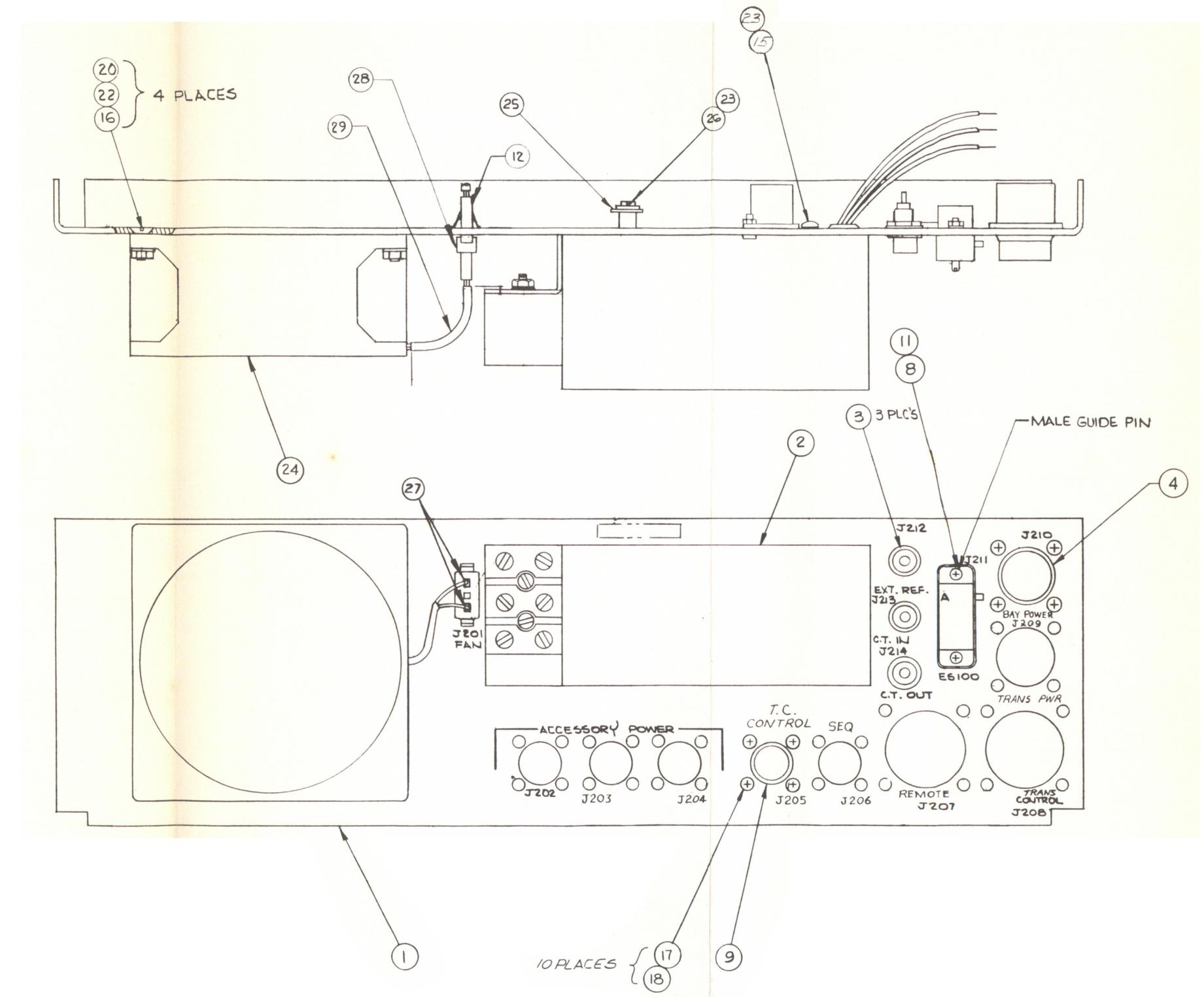


Regulated Power Supply (+24 Volt) Printed Wiring Assembly  
Dwg. No. 1212731-05F

REGULATED POWER SUPPLY (+24V) PRINTED WIRING ASSEMBLY				CATALOG NO.	1212731	Sheet 1 of 1	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-05	
1	1212730-02			PRINTED WIRING BOARD		1	
3	013-445		VR1	DIODE, Silicon		1	
4	013-599		CR1, 2	DIODE, Silicon		2	
6	014-364		Q1, 4	TRANSISTOR, Silicon, PNP		2	
7	014-383		Q2, 3	TRANSISTOR, Silicon, NPN		2	
9	030-094		C1, 3, 4	CAPACITOR, Ceramic Plate, 1 $\mu$ f, 25v		3	
10	037-058		C5	CAPACITOR, Tantalum, 1 $\mu$ f, 35v		1	
11	037-156		C2	CAPACITOR, Tantalum, 220 $\mu$ f, 30v		1	
13	041-003		R1	RESISTOR, Fixed, composition, 100 ohms, 1/2w, 5%		1	
14	041-028		R15	RESISTOR, Fixed, composition, 330K ohms, 1/2w, 5%		1	
15	041-066		R12	RESISTOR, Fixed, composition, 33K ohms, 1/2w, 10%		1	
16	041-102		R9	RESISTOR, Fixed, composition, 1000 ohms, 1w, 5%		1	
17	041-231		R17	RESISTOR, Fixed, composition, 2000 ohms, 2w, 5%		1	
18	041-245		R4, 11, 14, 16	RESISTOR, Fixed, composition, 1000 ohms, 1/2w, 5%		4	
20	041-316		R13	RESISTOR, Fixed, composition, 2400 ohms, 1/2w, 5%		1	
21	041-314		R2	RESISTOR, Fixed, composition, 820 ohms, 2w, 5%		1	
22	041-330		R8	RESISTOR, Fixed, composition, 6800 ohms, 1/2w, 5%		1	
23	041-331		R5, 7	RESISTOR, Fixed, composition, 3300 ohms, 1/2w, 5%		2	
24	041-473		R3, 18	RESISTOR, Fixed, composition, 240 ohms, 1/2w, 5%		2	
25	044-481		R6	RESISTOR, Variable, 1000 ohms, 1/2w, 10%		1	
27	52528-01			HANDLE, Snap On, circuit board		1	
28	041-277		R10	RESISTOR, Fixed, 82 ohms, 1/2w, 5%			
29	148-058			CONNECTOR, Printed Circuit, tip jack, red		1	
31	280-130			PAD, Transistor		2	
32	280-131			PAD, Transistor		2	
34	103307-01			STANDOFF		4	
35	435-052			RETAINER, Cradle, comp mounting		1	
36	460-078			RIVET, Steel, .088 diameter x .125 long		3	
37		1212728		SCHEMATIC DIAGRAM	REF		
38				ARTWORK MASTER	REF		

1212731F

6.3-111/112



Connector Panel Assembly  
Dwg. No. 1213322-01D

CONNECTOR PANEL ASSEMBLY				CATALOG NO. 1213322	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION						
					-01						
1	1213031-03			PANEL, Connector	1						
2	1212794-01		FL1	LINE FILTER	1						
3	142-026	UG 1094/U	J212, 213 214	CONNECTOR	3						
4	169-027		J210	DUMMY CONNECTOR	1						
8	146-184		J211	CONNECTOR, Receptacle, 26 contacts	1						
9	146-389		J205	CONNECTOR, 6 Pin Socket	1						
11	169-129			SHELL CONNECTOR	1						
12	169-137		J201	CONNECTOR, 3 Pin Amp	1						
15	471-089			SCREW, Machine, phillips head, cross-recessed, #10-32 x 1/2 long	2						
16	471-537			SCREW, Machine, flat head, cross- recessed, #6-32 x 1/2 long	4						
17	471-575			SCREW, Machine, phillips head, cross-recessed, #4-40 x 5/16 long	10						
18	496-004			HEX, Nut, keps, #4-40	10						
20	492-009			HEX, Nut, #6-32	4						
22	502-002			LOCKWASHER, #6	4						
23	502-005			LOCKWASHER, #10	2						
24	591-128			FAN, PAPST	1						
25	474-082			GROUND STUD, 3/4 Diameter x 1/4 long	1						
26	471-091			SCREW, Machine, cross recessed, pan head, #10-32 x 3/4 long	1						
27	169-321			CONTACT CONNECTOR PIN	2						
28	169-136			CONNECT, Rectangular Plug, 3 cont	1						
29	600-009			TUBING, Insulation	A/R						

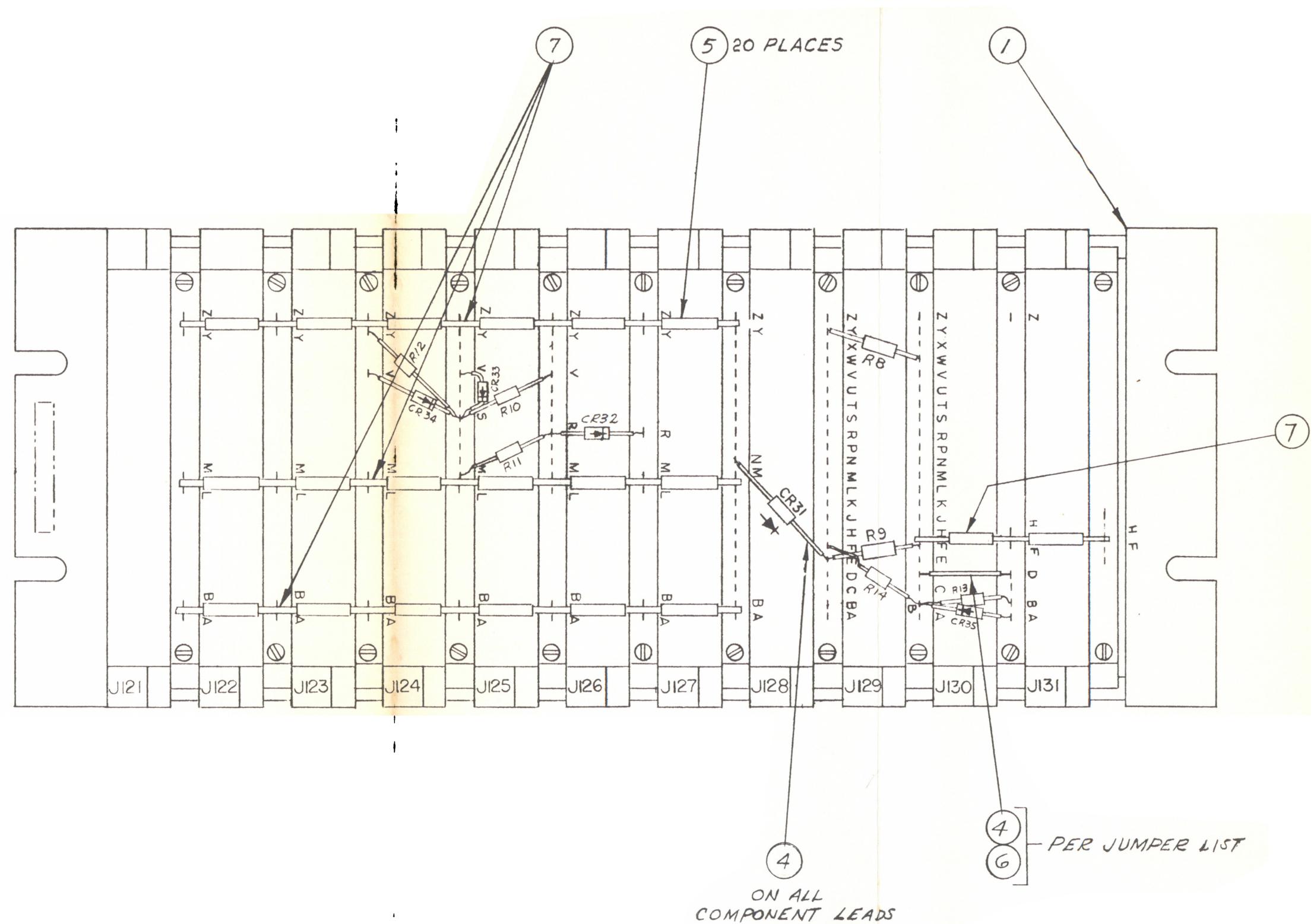
1213322D

6.3-115/116

CONTROL BAY HARNESS ASSEMBLY				CATALOG NO.	1214453	Sheet 1 of 1					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-05					
1	90798-10			CABLE COAXIAL, 27 AWG		A/R					
2	90802-10			CABLE SHIELDED, 2 Conductor, #22 AWG		A/R					
3	1212525-01	S18		SWITCH ROTARY		1					
4	1213043-01	J120		HEAT SINK BASE ASSEMBLY		1					
5	146-122	J202-204		CONNECTOR, 7 Pin Socket		3					
6	146-125	J209		CONNECTOR, 7 Pin Socket		1					
7	146-126	J207		CONNECTOR, 37 Pin Socket		1					
8	147-076	J208		CONNECTOR, 37 Pin Socket		1					
9	146-123	J206		CONNECTOR, 7 Pin Socket		1					
10	169-321			CONTACTS CONNECTOR		2					

1214453F

6.3-117/118



Control Bay Card Rack Assembly  
Dwg. No. 1214537-01

## CONTROL BAY CARD RACK ASSEMBLY

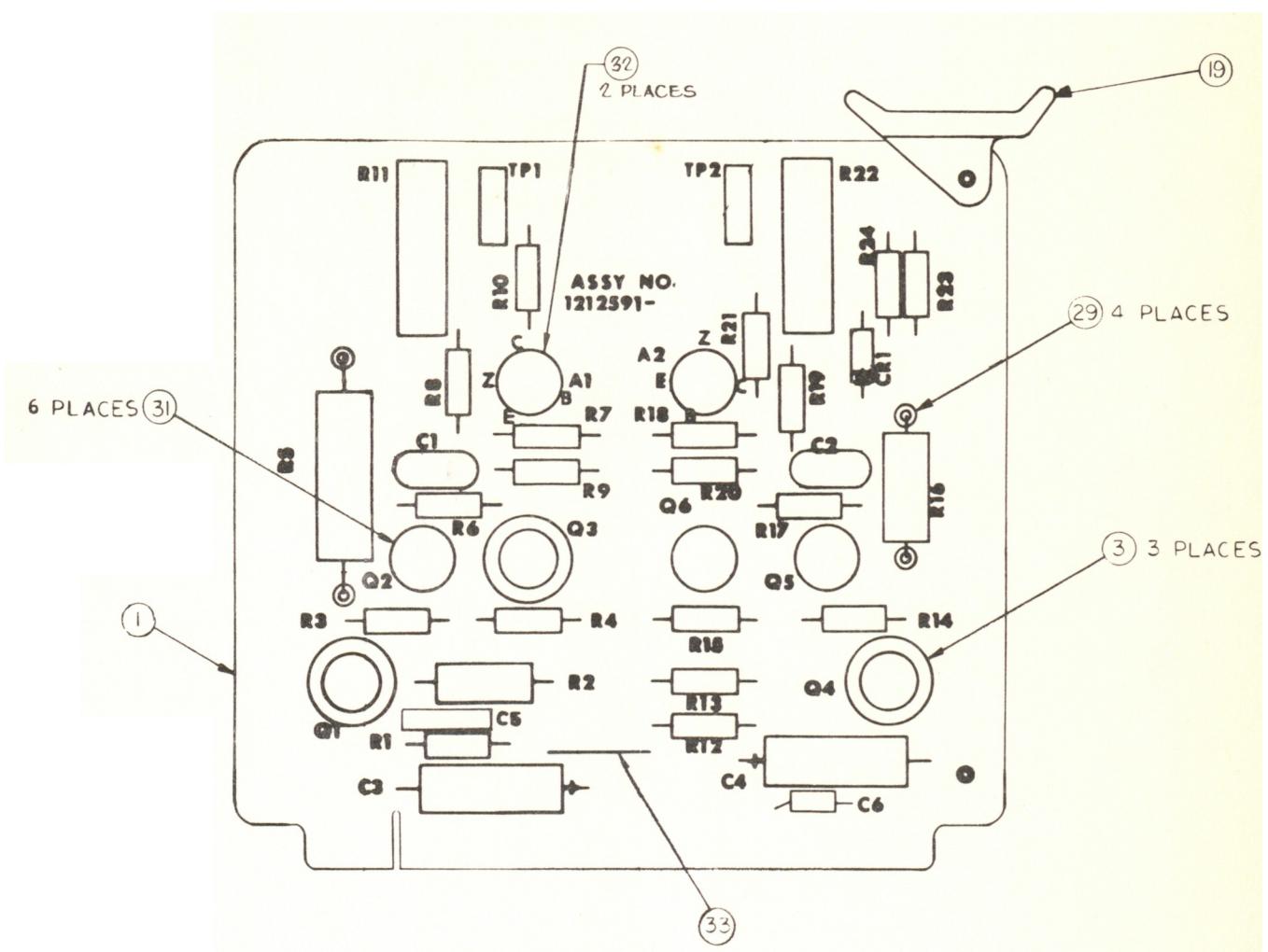
CATALOG NO. 1214537

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-02							
1	1213054-01			CARD RACK	1							
3	041-014		R8, R9, R11	RESISTOR, Fixed, 10 K, 1/2w, 5%	3							
8			1214292	SCHEMATIC DIAGRAM	REF							
12	041-475		R12	RESISTOR, Fixed, 3 K, 1/2w, 5%	1							
13	013-678	CD451	CR31, 32, 33, 34, 35	DIODE	5							
15	041-239		R14	RESISTOR, Fixed, 2.2 K, 1/2w, 5%	1							
16	041-343		R13	RESISTOR, Fixed, 680 ohm, 1/2w, 5%	1							
17	041-344		R10	RESISTOR, Fixed, 390 ohm, 1/2w, 5%	1							

1214537B

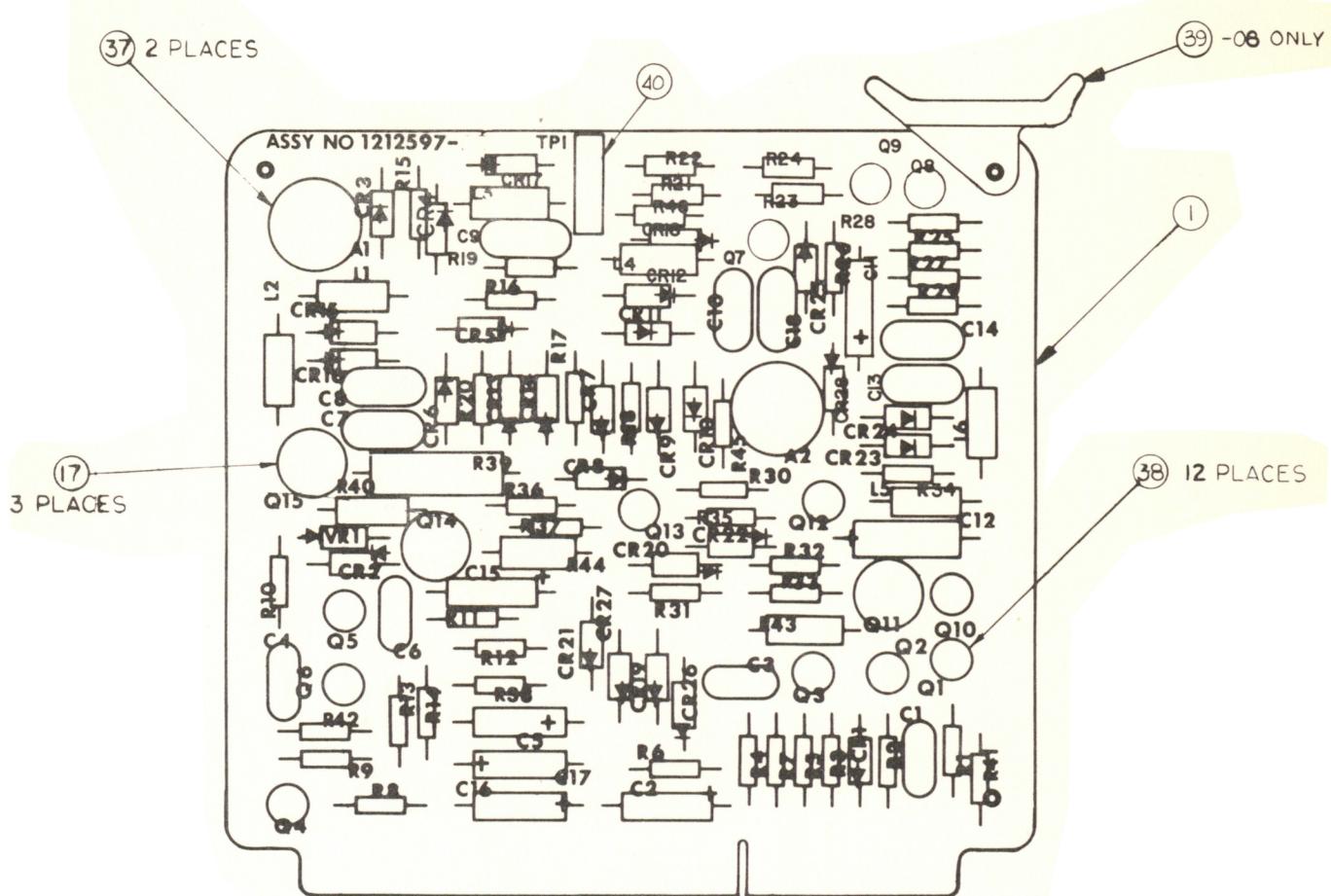
6.3-121/122



Regulated Power Supply (-12V, -27V) Printed Wiring Assembly  
Dwg. No. 1212591-04F

REGULATED POWER SUPPLY (-12V, -27V) PRINTED WIRING ASSEMBLY				CATALOG NO. 1212591	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION						
					-04						
1	1212592-03			PRINTED WIRING BOARD	1						
2	013-599		CR1	DIODE, Silicon	1						
3	014-070			HEATSINK, Transistor	3						
4	014-364		Q1 thru Q6	TRANSISTOR, Silicon, PNP	6						
5	586-003		A1, 2	REFERENCE AMPLIFIER ASSEMBLY	2						
6	034-933		C1, 2	CAPACITOR, Mica, 500 $\mu\text{f}$ , 300V	2						
7	037-252		C3, 4	CAPACITOR, Tantalum, 10 $\mu\text{f}$ , 35v	2						
8	041-001		R7, 8, 9, 20	RESISTOR, Fixed, 5.1 K, 1/2w, 5%	4						
9	041-003		R1	RESISTOR, Fixed, 100 ohms, 1/2w, 5%	1						
10	041-007		R10, 21	RESISTOR, Fixed, 750 ohms, 1/2w, 5%	2						
11	041-054		R19	RESISTOR, Fixed, 3.3 K, 1/2w, 10%	1						
12	041-245		R6, 17, 18	RESISTOR, Fixed, 1000 ohms, 1/2w, 5%	3						
13	041-309		R13	RESISTOR, Fixed, 8.2 K, 1/2w, 5%	1						
14	041-256		R24	RESISTOR, Fixed, 560 ohms, 1/2w, 5%	1						
15	041-303		R15	RESISTOR, Fixed, 3.9 K, 1/2w, 5%	1						
16	041-373		R4	RESISTOR, Fixed, 9.1 K, 1/2w, 5%	1						
17	041-404		R23	RESISTOR, Fixed, 510 ohms, 1/2w, 5%	1						
18	041-473		R3, 12, 14	RESISTOR, Fixed, 240 ohms, 1/2w, 5%	3						
19	1240695-01		J121	CARD EJECTOR	1						
20	041-274		R2	RESISTOR, Fixed, 3.9 K, 1w, 5%	1						
21	043-556		R5	RESISTOR, Wirewound, 1 ohm, 5w, 3%	1						
22	047-702		R16	RESISTOR, Wirewound, 2 ohms, 2w, 5%	1						
23	044-481		R22	RESISTOR, Variable, wirewound, 1 K, 1/2w, 10%	1						
24	044-748		R11	RESISTOR, Variable, wirewound, 5 K, 1/2w, 10%	1						
26	148-030		TP1	CONNECTOR, PC Tip Jack, blue	1						
27	148-058		TP2	CONNECTOR, PC Tip Jack, red	1						
28	030-095		C5, 6	CAPACITOR, Ceramic, 0.1 $\mu\text{f}$ , 25v	2						
29	103307-01		R5, 16	STANDOFF	4						
31	280-131			PAD, Transistor	6						
32	280-998			SPACER, Transistor	2						
33	615-002			WIRE, Bare, #22 AWG	A/R						
34		1212593		SCHEMATIC DIAGRAM	REF						
35	1212594			ARTWORK MASTER	REF						

1212591F



**Phase Comparator Printed Wiring Assembly**  
**Dwg. No. 1212597-08G**

PHASE COMPARATOR PRINTED WIRING ASSEMBLY				CATALOG NO. 1212597		Sheet 1 of 2	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-08	-09
1	1212596-02			PRINTED WIRING BOARD		1	1
2			1212595	SCHEMATIC		REF	REF
3	013-224	Per CD 32	VR1	DIODE, Zener, 6.8v		1	1
4	013-599	Per CD 458	CR1-10, 12-25, 28	DIODE		25	25
5	013-678	Per CD 451	CR26, 27	DIODE		2	2
6	014-248	CD 37	Q7, 9, 10, 12, 13	TRANSISTOR, Silicon, NPN		5	5
7	014-506	CD 446	Q1-6	TRANSISTOR, Silicon, NPN		6	6
8	014-505	CD 445	Q8	TRANSISTOR, Silicon, PNP		1	1
9	014-247	CD 38	Q11, 14, 15	TRANSISTOR, Silicon, NPN		3	3
11	541-969		L1-6	INDUCTOR, 1.5 mh, ±5%		6	6
14	034-962		C1-4	CAPACITOR, Mica, 33 pf, 500v, 5%		2	2
15	037-367		C2, 5, 11, 12, 15-17	CAPACITOR, Tantalum, 2.2 µf, 20v, 10%		7	7
16	034-184		C7-10, 13, 14	CAPACITOR, Mica, 68 pf, 500v, 5%		6	6
17	280-131			PAD, Transistor		3	3
18	586-015		A1, 2	CIRCUIT, Integrated Logic		2	2
19	041-406		R25, 29, 30	RESISTOR, 22K, 1/4w, 5%		3	3
20	041-414		R2, 9	RESISTOR, 2.2K, 1/4w, 5%		2	2
21	041-506		R3, 10	RESISTOR, 820 ohms, 1/4w, 5%		2	2
22	041-407		R4, 11, 24, 32, 36	RESISTOR, 3.3K, 1/4w, 5%		5	5
23	041-410		R5, 12	RESISTOR, 1K, 1/4w, 5%		2	2
24	041-425		R6, 13, 38	RESISTOR, 47 ohms, 1/4w, 5%		3	3
25	041-419		R7, 14, 41, 42	RESISTOR, 100 ohms, 1/4w, 5%		4	4
26	041-413		R15-20	RESISTOR, 6.8K, 1/4w, 5%		6	6
27	041-408		R21, 23, 31, 35, 45, 46	RESISTOR, 10K, 1/4w, 5%		6	6
28	041-432		R22	RESISTOR, 220K, 1/4w, 5%		1	1
29	041-412		R26, 28	RESISTOR, 4.7K, 1/4w, 5%		2	2
30	041-431		R1, 8	RESISTOR, 150K, 1/4w, 5%		2	2
31	041-495		R27	RESISTOR, 8.2K, 1/4w, 5%		1	1
32	041-409		R34	RESISTOR, 15K, 1/4w, 5%		1	1
33	041-518		R33, 37	RESISTOR, 33K, 1/4w, 5%		2	2
34	041-002		R43, 44	RESISTOR, 10 ohms, 1/2w, 5%		2	2

1212597G

6. 3-129

## PHASE COMPARATOR PRINTED WIRING ASSEMBLY

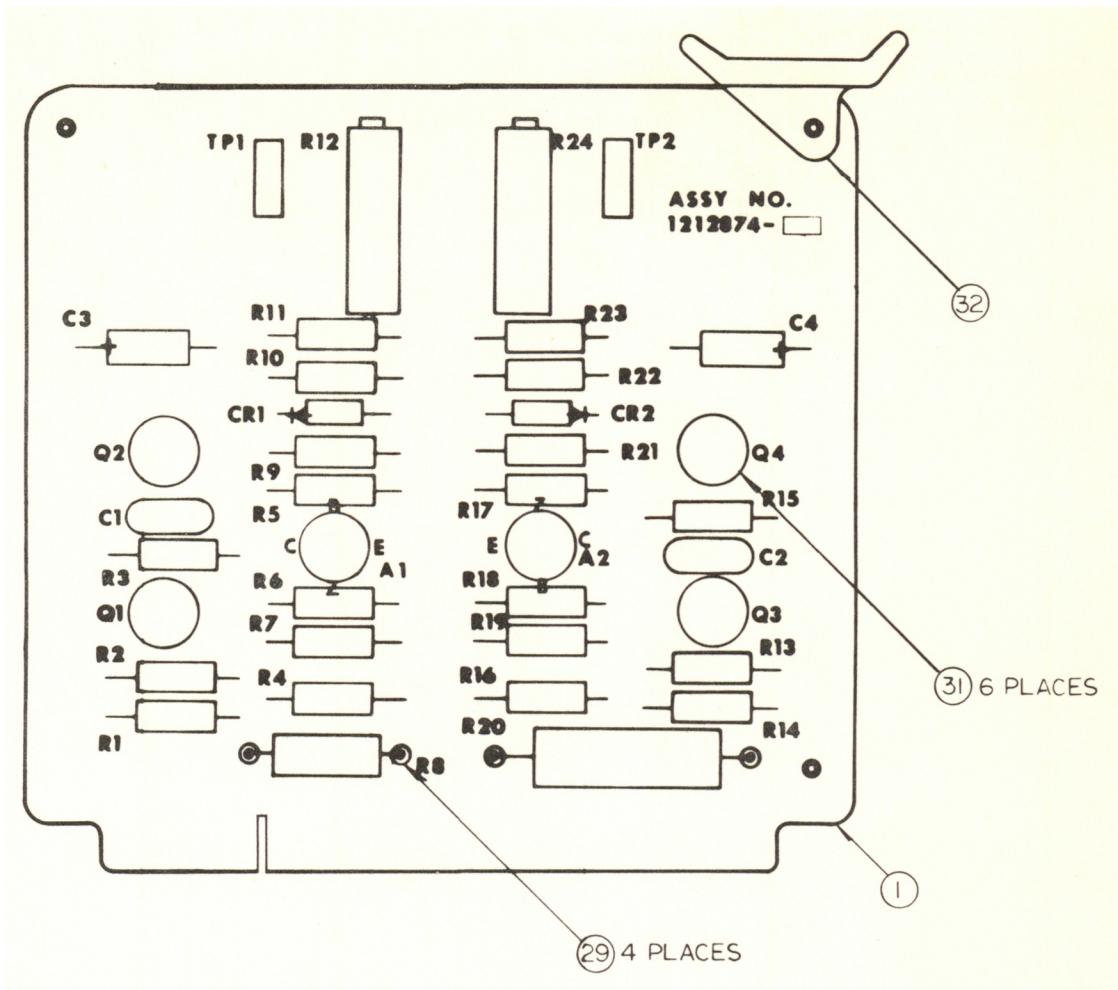
CATALOG NO. 1212597

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-08	-09				
35	041-344		R40	RESISTOR, 390 ohms, 1/2w, 5%		1	1				
36	041-688		R39	RESISTOR, 75 ohms, 2w, 5%		1	1				
37	280-174			SPACER, Micro-Circuit		2	2				
38	280-130			PAD, Transistor		12	12				
39	1240695-08		J129	CARD-EJECTOR		1	-				
40	148-028		TP1	CONNECTOR, Printed Circuit, tip jack		1	1				
41	013-650	Per CD 498	CR11	DIODE, Germanium		1	1				
42	034-215		C3, 6, 18	CAPACITOR, Mica, 10 pf, 500v, 5%		3	3				

1212597G

6.3-130



Regulated Power Supply (+10V, +12) Printed Wiring Assembly  
Dwg. No. 1212874-01B

## REGULATED POWER SUPPLY (+10V, +12V) PWA

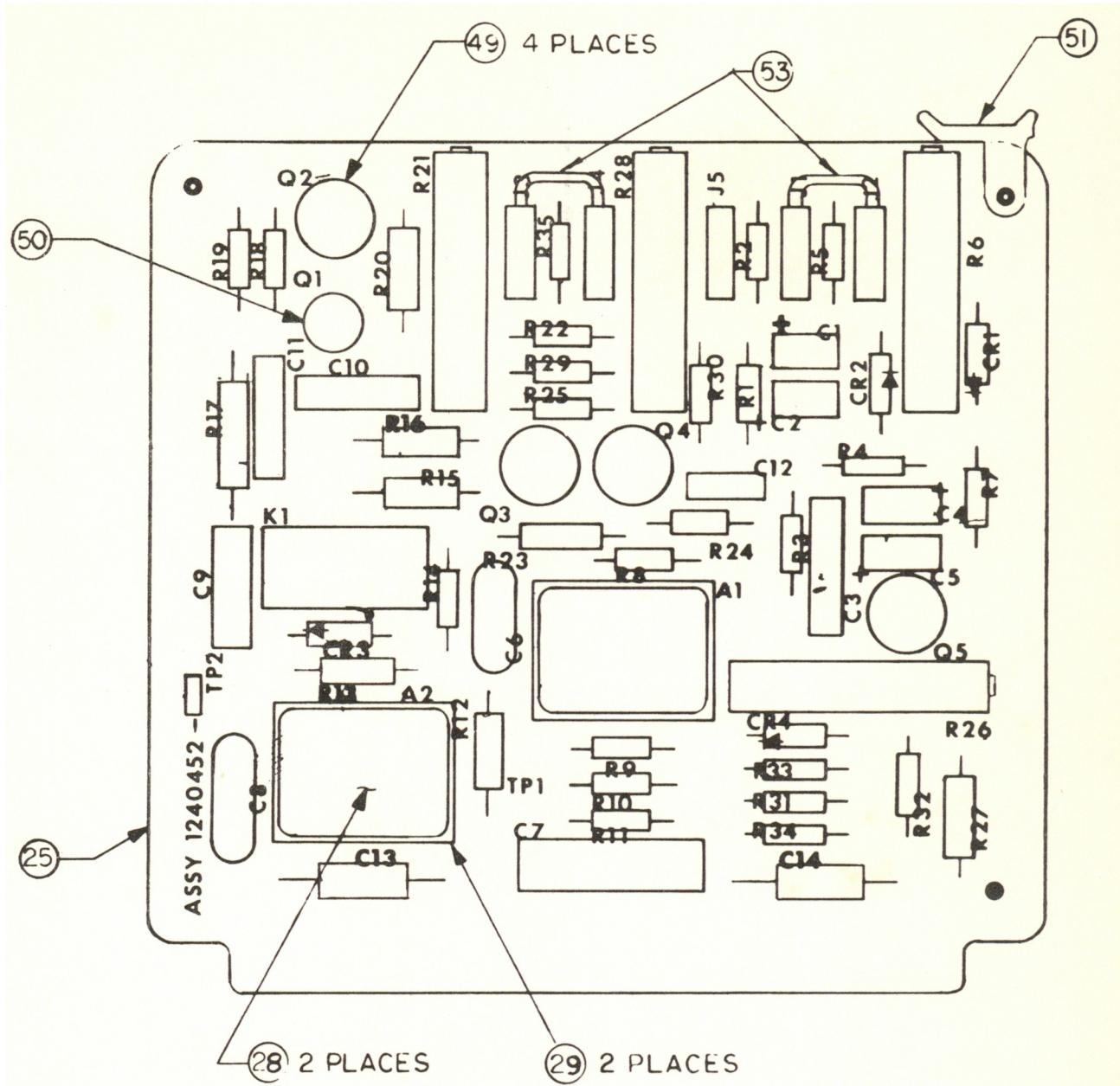
CATALOG NO. 1212874

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-01							
				PRINTED WIRING BOARD	1							
3	013-599		CR1, 2	DIODE, Silicon	2							
5	014-247		Q1, 2, 3, 4	TRANSISTOR, Silicon	4							
7	034-933		C1, 2	CAPACITOR, Mica, 500 PF, 300v	2							
8	037-087		C3, 4	CAPACITOR, Tantalum, 10 microfarad, 20v	2							
10	041-007		R11, 23	RESISTOR, Fixed, 750 ohms, 1/2w, 5%	2							
11	041-245		R3, 5, 15, 17	RESISTOR, Fixed, 1 K, 1/2w, 5%	4							
12	041-256		R9, 21	RESISTOR, Fixed, 560 ohms, 1/2w, 5%	2							
13	041-291		R1, 13	RESISTOR, Fixed, 160 ohms, 1/2w, 5%	2							
14	041-303		R7	RESISTOR, Fixed, 3.9 K, 1/2w, 5%	1							
15	041-316		R4, 16	RESISTOR, Fixed, 2.4 K, 1/2w, 5%	2							
16	041-404		R10, 22	RESISTOR, Fixed, 510 ohms, 1/2w, 5%	2							
17	041-473		R6, 18	RESISTOR, Fixed, 240 ohms, 1/2w, 5%	2							
18	041-477		R2, 14	RESISTOR, Fixed, 13 K, 1/2w, 5%	2							
19	047-437		R20	RESISTOR, Fixed, wirewound, 1 ohm, 5%, 5w	1							
20	044-481		R12, 24	RESISTOR, Variable, wirewound, 1 K, 1/2w, 10%	2							
21	041-012		R19	RESISTOR, Fixed, 4.3 K, 1/2w, 5%	1							
22	047-702		R8	RESISTOR, Fixed, wirewound, 2 ohms, 2w, 5%	1							
24	586-003		A1, 2	REFERENCE AMPLIFIER ASSEMBLY	2							
26	148-030		TP2	CONNECTOR, Printed Circuit, tip jack, blue	1							
27	148-058		TP1	CONNECTOR, Printed Circuit, tip jack, red	1							
29	103307-01		R8, 20	STANDOFF	4							
31	280-131			PAD, Transistor	6							
32	1240695-02		J12, 2	HANDLE-CARD EJECTOR	1							
35		1212876		SCHEMATIC DIAGRAM	REF							

1212874B

6.3-133/134



**Reel Servo Printed Wiring Assembly  
Dwg. No. 1240452-03C**

REEL SERVO PRINTED WIRING ASSEMBLY				CATALOG NO. 1240452	Sheet 1 of 2			
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-03		
1	041-008		R20	RESISTOR, Composition, 1.5K, 1/2w, 5%		1		
2	041-245		R23, 27	RESISTOR, Composition, 1000 ohms, 1/2w, 5%		2		
3	041-396		R19	RESISTOR, Composition, 220 ohms, 1/4w, 5%		1		
4	041-407		R8, 14	RESISTOR, Composition, 3.3K, 1/4w, 5%		2		
5	041-408		R2, 18, 32, 33	RESISTOR, Composition, 10K, 1/4w, 5%		4		
6	041-409		R35	RESISTOR, Composition, 15K, 1/4w, 5%		1		
7	041-411		R29	RESISTOR, Composition, 47K, 1/4w, 5%		1		
8	041-440		R34	RESISTOR, Composition, 1.2K, 1/4w, 5%		1		
9	041-414		R24	RESISTOR, Composition, 2.2K, 1/4w, 5%		1		
10	041-415		R10	RESISTOR, Composition, 68K, 1/4w, 5%		1		
11	041-419		R1	RESISTOR, Composition, 100 ohms, 1/4w, 5%		1		
12	041-429		R22, 30	RESISTOR, Composition, 680 ohms, 1/4w, 5%		2		
13	041-430		R25	RESISTOR, Composition, 1.5K, 1/4w, 5%		1		
14	041-507		R31	RESISTOR, Composition, 5.6K, 1/4w, 5%		1		
15	041-511		R5, 7	RESISTOR, Composition, 3.9K, 1/4w, 5%		2		
16	041-514		R11	RESISTOR, Composition, 9.1K, 1/4w, 5%		1		
17	041-518		R4	RESISTOR, Composition, 33K, 1/4w, 5%		1		
18	041-757		R3	RESISTOR, Composition, 160K, 1/4w, 5%		1		
19	041-758		R9	RESISTOR, Composition, 200K, 1/4w, 5%		1		
20	042-377		R17	RESISTOR, Fixed, carbon, film, 5.6K, 1/4w, 1%		1		
21	044-285		R6, 26, 28	RESISTOR, Variable, 2.5K, 1/4w, 10%		3		
22	044-290		R21	RESISTOR, Variable, 10K, 20%, 1/4w		1		
23	048-054		R12, 13	RESISTOR, Composition, carbon film, 10K, 1/4w, 1%		2		
24	048-187		R15, 16	RESISTOR, Carbon Film, 11K, 1/4w, 1%		2		
27			1240454	SCHEMATIC		REF		
28	1212070-02		A1, 2	OPERATIONAL AMPLIFIER ASSEMBLY		2		
29	1212074-01			SPACER, Operational Amplifier		2		
30	013-599	CD458	CR1-4	DIODE, Silicon		4		
31	014-247	CD38	Q2-5	TRANSISTOR, Silicon, NPN		4		
32	014-505	CD445	Q1	TRANSISTOR, Silicon, PNP		1		
33	020-425		K1	RELAY, Armature, 2PDT		1		
34	020-438			MOUNTING PAD, Relay		1		
35	035-814		C12	CAPACITOR, Mylar, .033 $\mu$ f, 50v, 5%		1		

1240452C

## REEL SERVO PRINTED WIRING ASSEMBLY

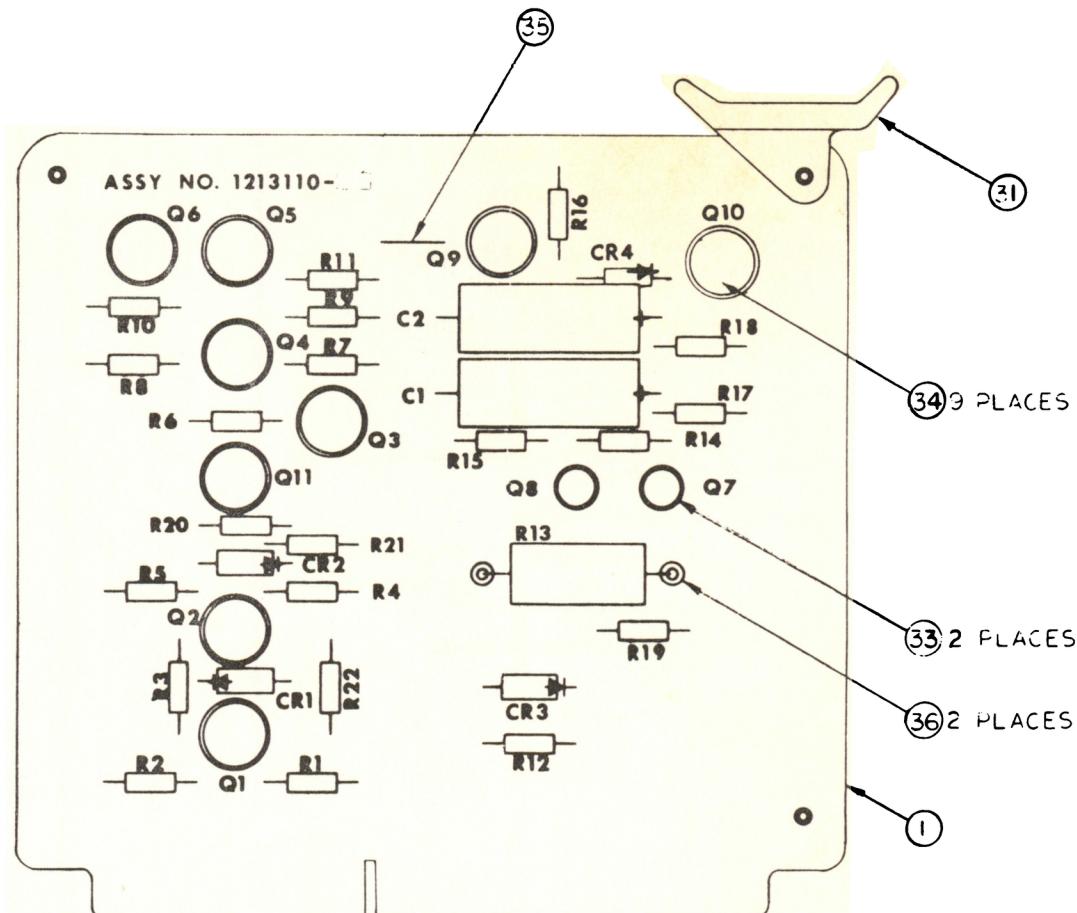
CATALOG NO. 1240452

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-03						
36	035-844		C6, 8	CAPACITOR, Mylar, .001 $\mu$ f, 50v, 10%		2						
37	035-856		C3	CAPACITOR, Mylar, .27 $\mu$ f, 50v, 5%		1						
38	035-865		C10, 11	CAPACITOR, Mylar, .12 $\mu$ f, 50v, 5%		2						
39	035-881		C9	CAPACITOR, Mylar, .22 $\mu$ f, 50v, 5%		1						
40	035-904		C7	CAPACITOR, Mylar, .68 $\mu$ f, 50v, 5%		1						
41	037-137		C13, 14	CAPACITOR, Tantalum, 15 $\mu$ f, 15v, 20%		2						
42	037-425		C4, 5	CAPACITOR, Tantalum, 10 $\mu$ f, 35v, 10%		2						
43	037-443		C1, 2	CAPACITOR, Tantalum, 6.8 $\mu$ f, 15v, 10%		2						
44	148-028		J1	CONNECTOR, Printed Circuit, tip jack, white		1						
45	148-029		J2	CONNECTOR, Printed Circuit, tip jack, green		1						
46	148-030		J3	CONNECTOR, Printed Circuit, tip jack, blue		1						
47	148-031		J4	CONNECTOR, Printed Circuit, tip jack, yellow		1						
48	148-052		J5	CONNECTOR, Printed Circuit, tip jack, black		1						
49	280-131		Q2-5	TRANSISTOR PAD		4						
50	280-130		Q1	TRANSISTOR PAD		1						
51	1240695-16		J123, 124	HANDLE, Card Ejector		1						
52	1240453-02			PRINTED WIRING BOARD		1						

1240452C

6.3-138



Control Circuit Optics Printed Wiring Assembly  
Dwg. No. 1213110-03C

CONTROL CIRCUIT OPTICS PRINTED WIRING ASSEMBLY				CATALOG NO.	1213110	Sheet 1 of 2					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-03					
1	1213111-03			PRINTED WIRING BOARD		1					
3	013-599	CD458	CR1, 2, 4	DIODE, Silicon		3					
5	014-111	2N1306	Q4, 5	TRANSISTOR, Germanium, NPN		2					
6	014-247	CD38	Q1-3, 6, 9, 10	TRANSISTOR, Silicon, NPN		6					
7	014-505	CD445	Q7, 8	TRANSISTOR, Silicon, PNP		2					
8	014-364	CD438	Q11	TRANSISTOR, Silicon, PNP		1					
9	037-108		C1, 2	CAPACITOR, Tantalum, 47 $\mu$ f, 35v		2					
10	013-983	CD32	CR3	DIODE, Silicon		1					
11	041-412		R5	RESISTOR, Fixed Composition, 4.7K ohms, 1/4w, 5%		1					
12	041-419		R22	RESISTOR, Fixed, composition, 100 ohms, 1/4w, 5%		1					
13	041-426		R19	RESISTOR, Fixed, composition, 68 ohms, 1/4, 5%		1					
14	041-430		R2	RESISTOR, Fixed, composition, 1.5K ohms, 1/4w, 5%		1					
15	041-482		R7, 9	RESISTOR, Fixed, composition, 12K ohms, 1/4w, 5%		2					
16	041-504		R20	RESISTOR, Fixed, composition, 510 ohms, 1/4w, 5%		1					
17	041-507		R12	RESISTOR, Fixed, composition, 5.6K ohms, 1/4w, 5%		1					
18	041-531		R14	RESISTOR, Fixed, composition, 750 ohms, 1/4w, 5%		1					
19	041-532		R17, 18	RESISTOR, Fixed, composition, 910 ohms, 1/4w, 5%		2					
20	041-538		R8, 10	RESISTOR, Fixed, composition, 6.2K ohms, 1/4w, 5%		2					
21	041-543		R16	RESISTOR, Fixed, composition, 82K ohms, 1/4w, 5%		1					
22	041-560		R21	RESISTOR, Fixed, composition, 2K ohms, 1/4w, 5%		1					
23	041-573		R1	RESISTOR, Fixed, composition, 75K ohms, 1/4w, 5%		1					
24	041-744		R6	RESISTOR, Fixed, composition, 1.3K ohms, 1/4w, 5%		1					
25	041-667		R13	RESISTOR, Fixed, composition, 10 ohms, 2w, 5%		1					
26	041-743		R11	RESISTOR, Fixed, composition, 430 ohms, 1/4w, 5%		1					
27	041-584		R15	RESISTOR, Fixed, composition, 4.3K ohms, 1/4w, 5%		1					
28	041-753		R3	RESISTOR, Fixed, composition, 62K ohms, 1/4w, 5%		1					
29	041-973		R4	RESISTOR, Fixed, composition, 1.1K ohms, 1/4w, 5%		1					

1213110C

6.3-141

## CONTROL CIRCUIT OPTICS PRINTED WIRING ASSEMBLY

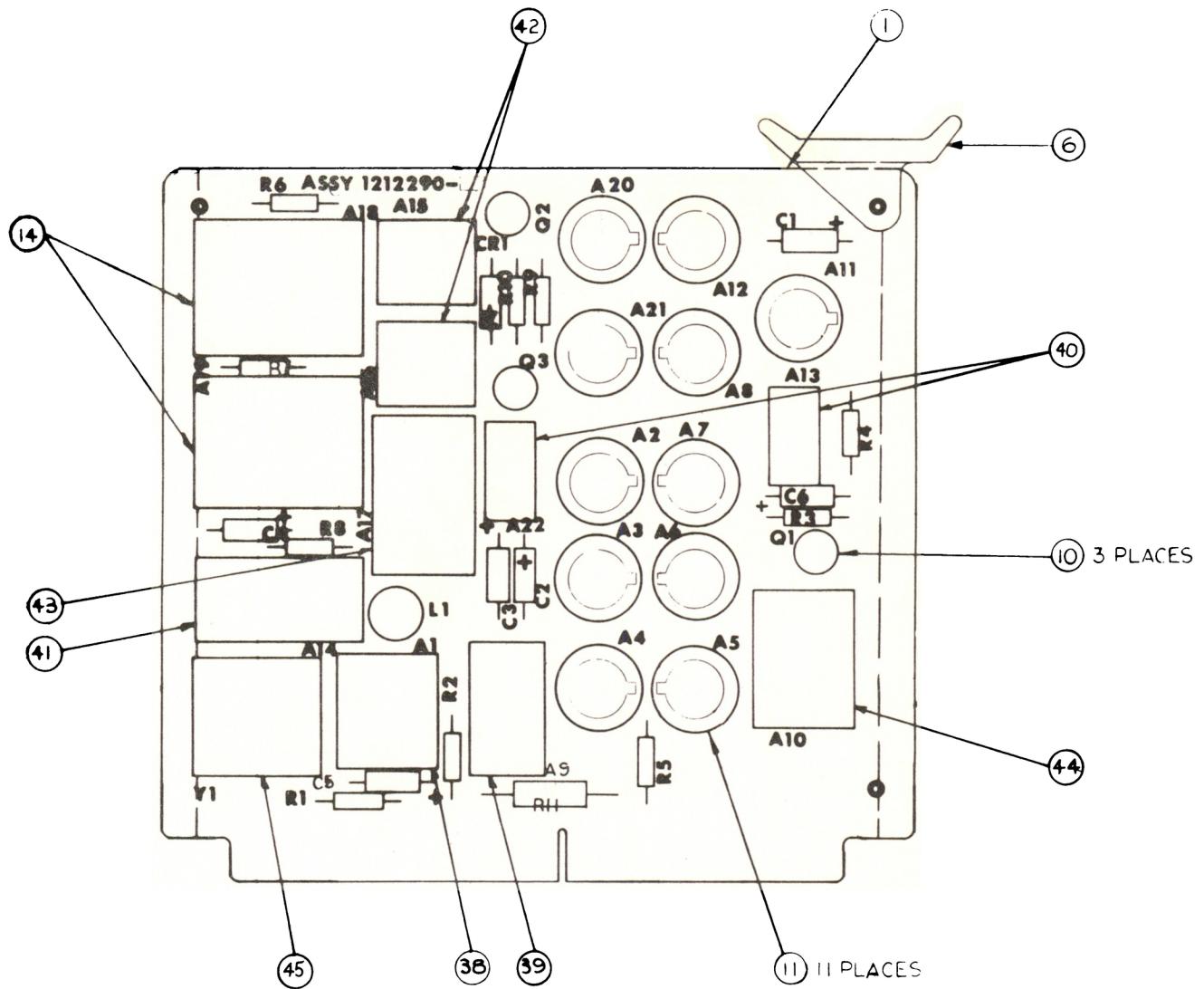
CATALOG NO. 1213110

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-03						
31	1240695-04	J125		HANDLE, Card Ejector		1						
33	280-130			PAD, Transistor		2						
34	280-131			PAD, Transistor		9						
36	103307-01			STANDOFF		2						
38			1213113	SCHEMATIC DIAGRAM		REF						

1213110C

6.3-142



**Frequency Divider Printed Wiring Assembly**  
**Dwg. No. 1212290-08-10J**

FREQUENCY DIVIDER PRINTED WIRING ASSEMBLY				CATALOG NO. 1212290			Sheet 1 of 2	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-08	-10	
1	1212289-02			PRINTED WIRING BOARD		1	1	
5		1212287		SCHEMATIC	REF	REF		
6	1240695-07	J128		HANDLE CARD EJECTOR		1	1	
10	280-130			SPACER, Transistor Pad		3	3	
11	280-174			MOUNTING PAD, Micro-Circuit, 10 lead		11	11	
13	1212070-02	A18, 19		OPERATIONAL AMPLIFIER ASSEMBLY		2	2	
14	1212074-02			SPACER, Insulating, operational amplifier		2	2	
15	1212317-02	A1		CRYSTAL OSCILLATOR ASSEMBLY		1	1	
16	1212291-01	A9		HIGH SPEED COMMAND GATES ASSEMBLY		1	1	
17	1212311-01	A10		LOW SPEED COMMAND GATES ASSEMBLY		1	1	
18	1212295-01	A13, 22		HIGH/LOW SPEED SELECT GATES ASSEMBLY		2	2	
19	1212303-01	A15, 16		CONTROL TRACK & TACHOMETER SQUARING ASSEMBLY		2	2	
20	1212310-02	A17		CONTROL TRACK SENSOR ASSEMBLY		1	1	
21	1212300-01	A14		CONTROL TRACK INPUT AMPLIFIER ASSEMBLY		1	1	
22	041-511	R6, 7		RESISTOR, Fixed Type, 3.9K, 1/4w, 5%		2	2	
23	586-004	A2-8, 11, 12, 20, 21		MICROLOGIC		11	11	
24	041-291	R11		RESISTOR, Fixed, 160 ohms, 1/2w, 5%		1	1	
25	017-049	Y1		CRYSTAL, 400 kc		1	1	
26	013-599	CR1		DIODE, Silicon		1	1	
27	051-451			INDUCTOR, Variable, 1000 $\mu$ h		1	1	
28	014-248	Q1, 2, 3		TRANSISTOR, Silicon		3	-	
29	037-367	C1, 4-6		CAPACITOR, Tantalum, 2.2 $\mu$ f, 20v		4	4	
30	037-058	C2, 3		CAPACITOR, Tantalum, 1 $\mu$ f, 35v, 20%		2	2	
31	041-408	R1		RESISTOR, Fixed, 10K, 1/4w, 5%		1	1	
32	041-496	R2, 5		RESISTOR, Fixed, 10 ohms, 1/4w, 5%		2	2	
34	041-560	R10		RESISTOR, Fixed, 2K, 1/4w, 5%		1	1	
35	041-519	R3		RESISTOR, Fixed, 56K, 1/4w, 5%		1	-	
36	041-414	R4, 9		RESISTOR, Fixed, 2.2K, 1/4w, 5%		2	2	
37	041-419	R8		RESISTOR, Fixed, 100 ohms, 1/4w, 5%		1	1	
38	1243487-01			SPACER, Insulating, crystal oscillator		1	1	
39	1243488-01			SPACER, Insulating, high speed command gates		1	1	
40	1243489-01			SPACER, Insulating, high/low speed select gates		2	2	

1212290J

6.3-145

## FREQUENCY DIVIDER PRINTED WIRING ASSEMBLY

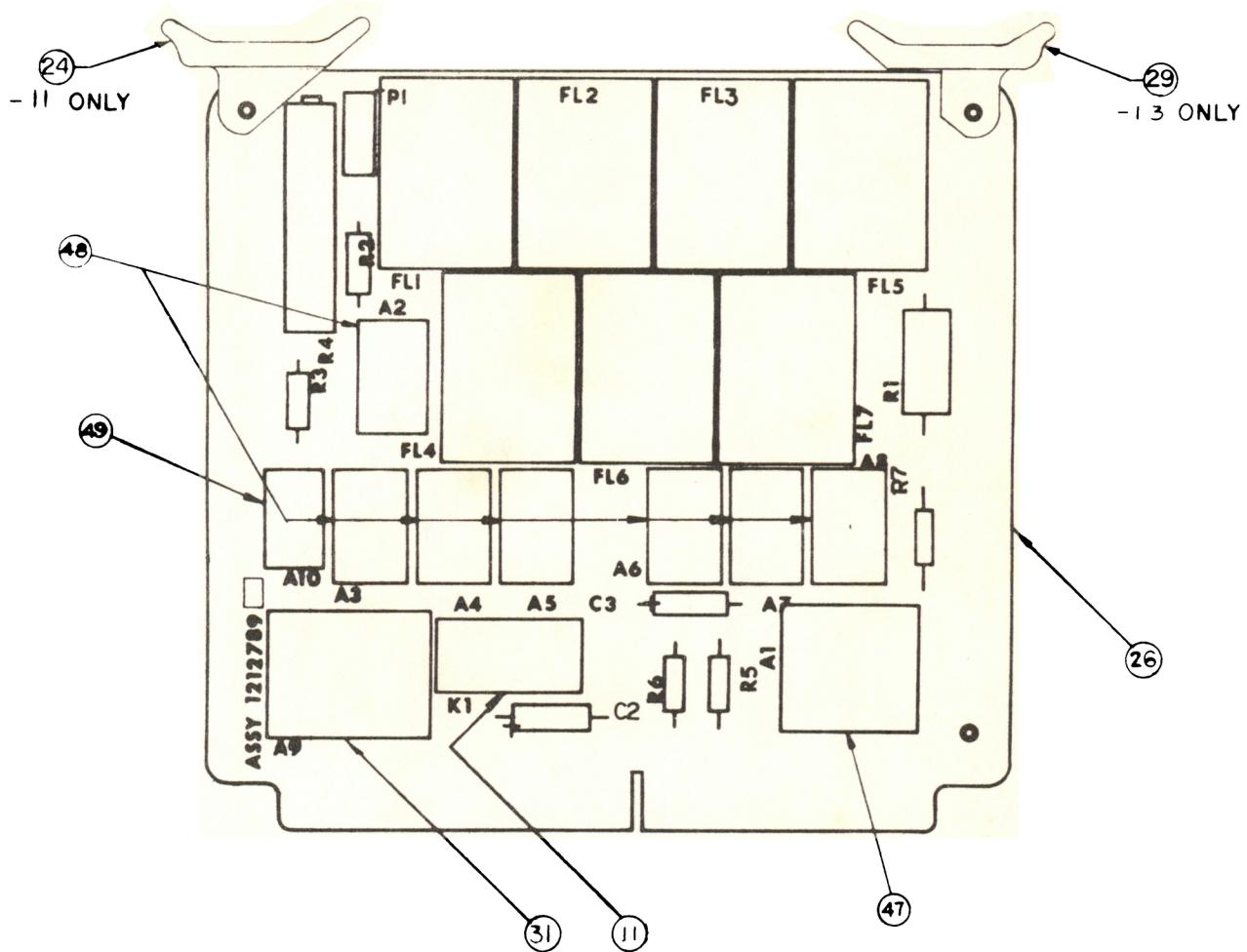
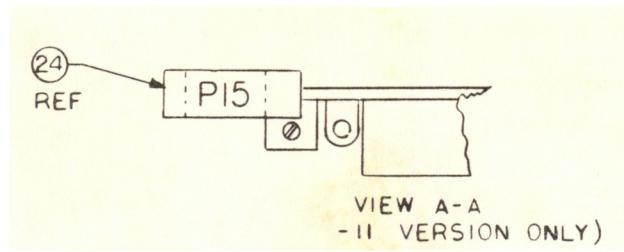
CATALOG NO. 1212290

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-08	-10				
41	1243490-01			SPACER, Insulating, control track input amplifier		1	1				
42	1243491-01			SPACER, Insulating, control track and tachometer squaring circuits		2	2				
43	1243492-01			SPACER, Insulating, control track sensor		1	1				
44	1243493-01			SPACER, Insulating, low speed command gates		1	1				
45	1243723-01			SPACER, Insulating Crystal		1	1				
46	014-506	Q1		TRANSISTOR, Silicone		-	1				
47	014-248	Q2, 3		TRANSISTOR, Silicone		-	2				
48	041-484	R3		RESISTOR, Fixed, 120K, 1/4w, 5%		-	1				

1212290J

6.3-146



**Control Track Filters Printed Wiring Assembly**  
**Dwg. No. 1212789-11-12-13L**

CONTROL TRACK FILTERS PRINTED WIRING ASSEMBLY				CATALOG NO.	Sheet 1 of 2			
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-11	-12	-13
2	041-412		R2	RESISTOR, Fixed, 4.7K ohms, 1/4w, 5%		1	1	1
3	041-983		R1	RESISTOR, Fixed, 300 ohms, 1w, 5%		1	1	1
5	041-410		R3	RESISTOR, Fixed, 1K, 1/4w, 5%		1	1	1
6	041-743		R5	RESISTOR, Fixed, 430 ohms, 1/4w, 5%		1	1	1
7	041-408		R6	RESISTOR, Fixed, 10K, 1/4w, 5%		1	1	1
8	044-610		R4	RESISTOR, Variable, carbon, 10K, 1/4w, 10%		1	1	1
9	041-496		R7	RESISTOR, Composition, 10 ohms, 1/4w, 5%		1	1	1
10	020-425		K1	RELAY		1	1	1
11	020-438			INSULATOR, Relay Mounting, 8 pin		1	1	1
13	037-024		C2, 3	CAPACITOR, Tantalum, 2.2 $\mu$ f, 20v, 20%		2	2	2
14	1212534-02		FL1	FILTER, Band Pass, 200 kc		1	1	-
15	1212534-05		FL2	FILTER, Band Pass, 25 kc		1	1	-
16	1212534-08		FL3	FILTER, Band Pass, 3.125 kc		-	1	-
17	1212534-03		FL4	FILTER, Band Pass, 100 kc		1	1	-
18	1212534-04		FL5	FILTER, Band Pass, 50 kc		1	1	-
19	1212534-06		FL6	FILTER, Band Pass, 12.5 kc		1	1	-
20	1212534-07		FL7	FILTER, Band Pass, 6.25 kc		1	1	-
21	1212534-01		FL3	FILTER, Band Pass, 400 kc		1	-	-
23	1213249-01		A1	FILTER DRIVER AMPLIFIER ASSEMBLY		1	1	1
24	1240678-01			HANDLE, Card Ejector		1	-	-
25	1213437-01		A10	ATTENUATOR ASSEMBLY		1	1	1
26	1212792-03			PRINTED WIRING BOARD		1	1	1
27	1213433-01		A2-8	EMITTER FOLLOWER, Assembly		-	7	7
28	1213433-02		A2-8	EMITTER FOLLOWER, Assembly		7	-	-
29	1240695-06		J127	HANDLE, Card Ejector		-	-	1
30	1212070-02		A9	OPERATIONAL AMPLIFIER ASSEMBLY		1	1	1
31	1212074-02			SPACER, Operational Amplifier		1	1	1
32	148-058		TP1	CONNECTOR, Printed Circuit, tip jack		1	1	1
33		1216755		SCHEMATIC	REF	-	-	
34		1212791		SCHEMATIC		-	REF	REF
40	1242624-02		FL1	FILTER, Band Pass, 200 kc		-	-	1
41	1242624-03		FL4	FILTER, Band Pass, 100 kc		-	-	1
42	1242624-04		FL5	FILTER, Band Pass, 50 kc		-	-	1
43	1242624-05		FL2	FILTER, Band Pass, 25 kc		-	-	1
44	1242624-06		FL6	FILTER, Band Pass, 12.5 kc		-	-	1

1212789L

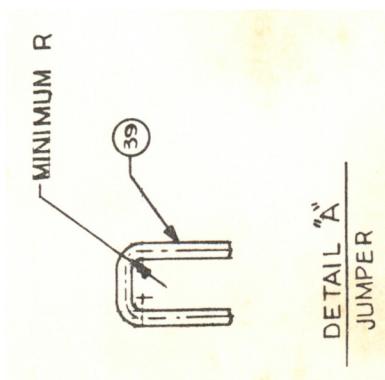
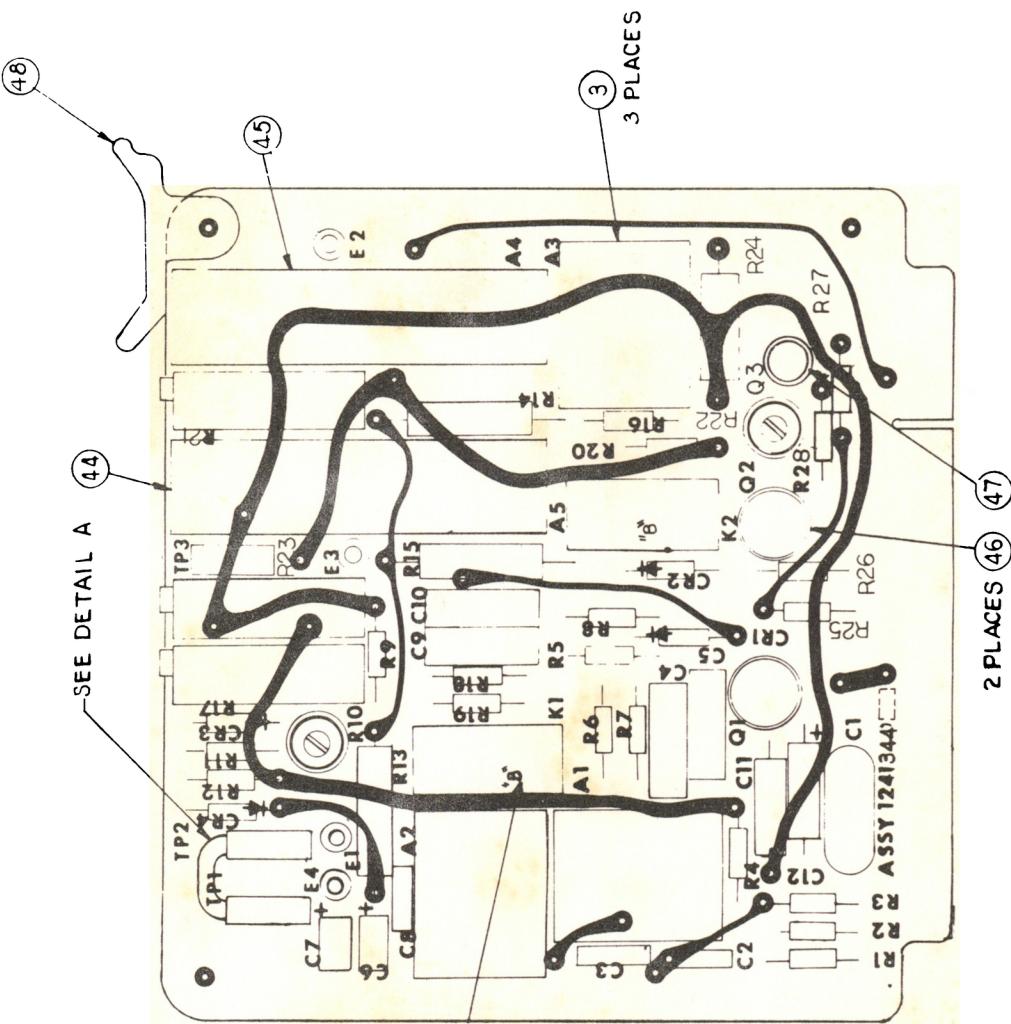
## CONTROL TRACK FILTERS PRINTED WIRING ASSEMBLY

CATALOG NO. 1212789

Sheet 2 of 2

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-11	-12	-13
45	1242624-07		FL7	FILTER, Band Pass, 6.25 kc		-	-	1
46	1242624-08		FL3	FILTER, Band Pass, 3.125 kc		-	-	1
47	1243495-01			SPACER, Insulating, filter driver amplifier		1	1	1
48	1243496-01			SPACER, Insulating, emitter follower		7	7	7
49	1243497-01			SPACER, Insulating, attenuator		1	1	1

1212789L



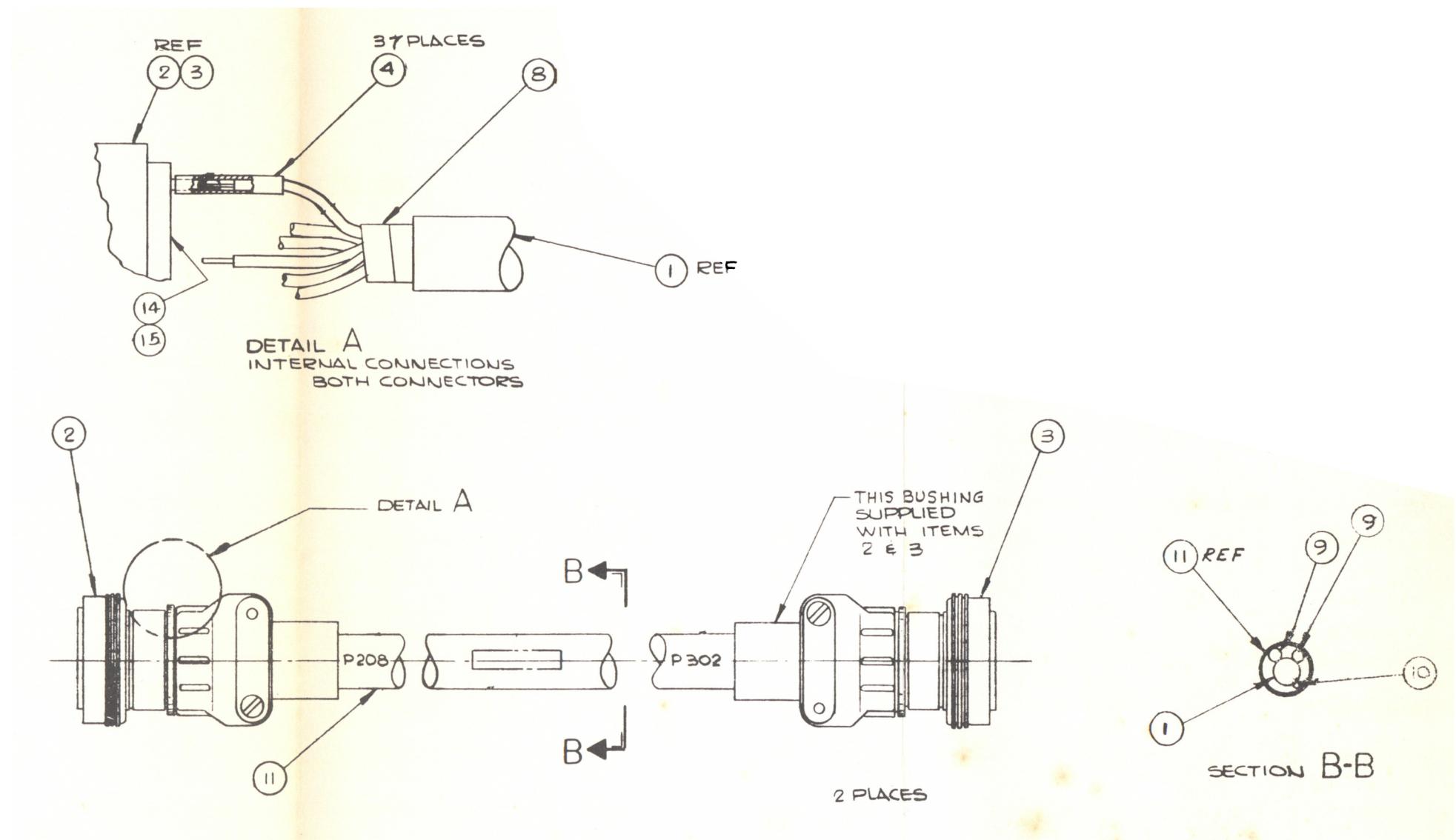
Capstan Servo Compensation and Brake Amplifier Printed Wiring Assembly  
Dwg. No. 1241344-02A

CAPSTAN SERVO COMPENSATION AND BRAKE AMPLIFIER PRINTED WIRING ASSEMBLY				CATALOG NO. 1241344	Sheet 1 of 2						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-02					
1	1241343-01			PRINTED CIRCUIT BOARD		1					
2	1212070-02		A1-3	OPERATIONAL AMPLIFIER ASSEMBLY		3					
3	1212074-01			SPACER, Operational Amplifier		3					
4	1243075-01		A5	CORDWOOD ASSEMBLY, Board No. 1		1					
5	1243072-01		A4	CORDWOOD ASSEMBLY, Board No. 2		1					
6	013-399	CD458	CR1-4	DIODE, Silicon		4					
7	014-247	CD38	Q1, 2	TRANSISTOR, NPN		2					
8	014-505	CD445	Q3	TRANSISTOR, PNP		1					
9	020-425		K1, 2	RELAY, Armature, 2PDT		2					
10	020-438			MOUNTING PAD, Relay		2					
11	035-327		C1	CAPACITOR, Mylar, .15 $\mu$ f, 50v, 5%		1					
12	035-818		C5, 10	CAPACITOR, Mylar, .18 $\mu$ f, 50v, 5%		2					
13	035-844		C3, 8	CAPACITOR, Mylar, .001 $\mu$ f, 50v, 10%		2					
14	035-881		C4, 9	CAPACITOR, Mylar, .22 $\mu$ f, 50v, 5%		2					
15	037-137		C11, 12	CAPACITOR, Electrolytic, 15 $\mu$ f, 15v, 20%		2					
16	037-425		C6, 7	CAPACITOR, Tantalum, 10 $\mu$ f, 35v, 10%		2					
17	041-394		R6	RESISTOR, Composition, 100K ohms, 1/4w, 5%		1					
18	041-407		R4, 16	RESISTOR, Composition, 3300 ohms, 1/4w, 5%		2					
19	041-412		R20	RESISTOR, Composition, 4700 ohms, 1/4w, 5%		1					
20	041-415		R7	RESISTOR, Composition, 68K ohms, 1/4w, 5%		1					
21	041-429		R11	RESISTOR, Composition, 680 ohms, 1/4w, 5%		1					
22	041-440		R9, 12	RESISTOR, Composition, 1200 ohms, 1/4w, 5%		2					
23	041-482		R18, 19	RESISTOR, Composition, 12K ohms, 1/4w, 5%		2					
24	041-495		R5	RESISTOR, Fixed, composition, 8200 ohms, 1/4w, 5%		1					
25	041-508		R2, 3	RESISTOR, Composition, 20K ohms, 1/4w, 5%		2					
26	041-514		R1	RESISTOR, Fixed, composition, 9100 ohms, 1/4w, 5%		1					
27	041-518		R25, 26	RESISTOR, Fixed, composition, 33K ohms, 1/4w, 5%		2					
28	041-519		R27, 28	RESISTOR, Composition, 56K ohms, 1/4w, 5%		2					
29	041-561		R8	RESISTOR, Composition, 5100 ohms, 1/4w, 5%		1					

1241344B

CAPSTAN SERVO COMPENSATION AND BRAKE AMPLIFIER PRINTED WIRING ASSEMBLY				CATALOG NO. 1241344	Sheet 2 of 2					
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION				
						-02				
30	041-983		R24	RESISTOR, Fixed, composition, 300 ohms, 1w, 5%		1				
31	044-529		R21, 23	RESISTOR, Variable, 5000 ohms, 1w, ±10%		2				
32	044-571		R17	RESISTOR, Variable, 20,000 ohms, 1/2w, ±10%		1				
33	044-943		R22	RESISTOR, Variable, 2000 ohms, 1/2w, ±30%		1				
34	044-944		R10	RESISTOR, Variable, 5000 ohms, 1/2w, ±30%		1				
35	048-794		R15	RESISTOR, Metal Film, 1000 ohms, 1/2w, 1%		1				
36	048-405		R14	RESISTOR, Metal Film, 1500 ohms, 1/2w, 1%		1				
37	048-813		R13	RESISTOR, Metal Film, 4320 ohms, 1/2w, 1%		1				
38	055-137		C2	CAPACITOR, Mylar, .003 µf, 50v, 5%		1				
40	148-027		TP2	CONNECTOR, Tip Jack, red		1				
41	148-028		TP1	CONNECTOR, Tip Jack, white		1				
42	148-052		TP3	CONNECTOR, Tip Jack, black		1				
43		1241345		SCHEMATIC		REF				
44	1243326-01			SPACER, Cordwood No. 1		1				
45	1243327-01			SPACER, Cordwood No. 2		1				
46	280-131		Q1, 2	TRANSISTOR PAD		2				
47	280-130		Q3	TRANSISTOR PAD		1				
48	1240695-15		J130	HANDLE, Card Ejector		1				

1241344B

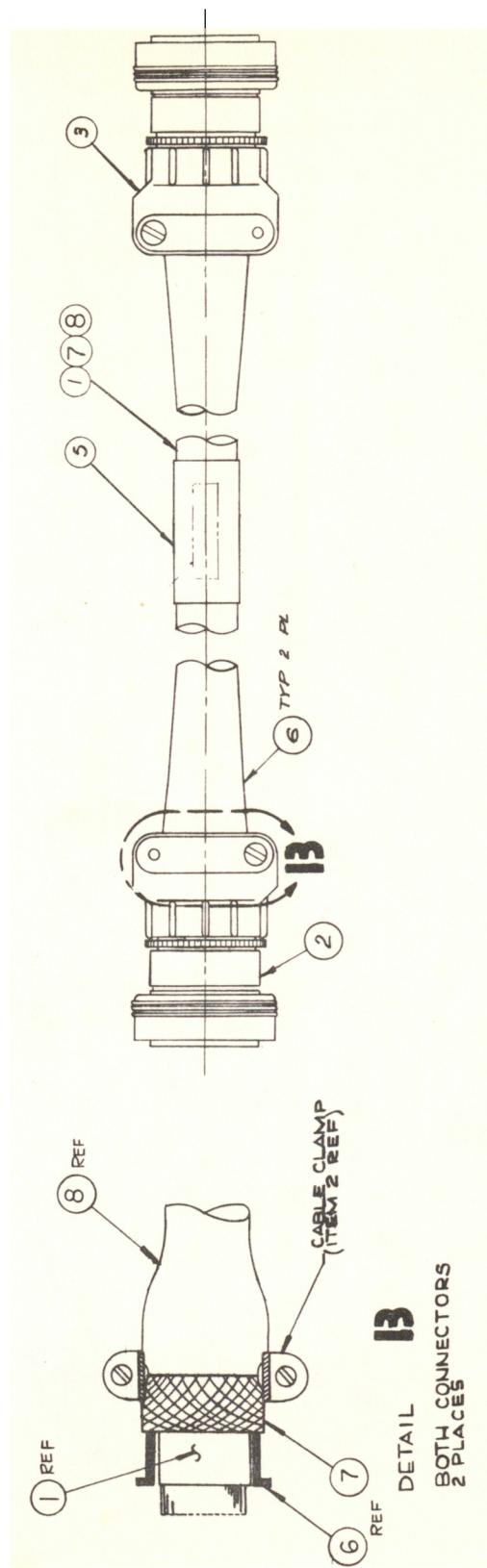


Transport Control Cable Assembly  
Dwg. No. 1213091-03C

TRANSPORT CONTROL CABLE ASSEMBLY				CATALOG NO. 1213091	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-03					
1	90806-10			CABLE, 30 conductor, #22 AWG	A/R						
2	144-089	P208		CONNECTOR, Female, shell, 37 socket	1						
3	145-115	P302		CONNECTOR, Female, shell, 37 pin	1						
9	90802-10			CABLE, Shielded, 2 conductor, #22 AWG	A/R						
10	90798-10			CABLE, Coaxial, #27 AWG	A/R						
14	232-007			PLASTIC	A/R						
15	087-067			RESIN, Hardener	A/R						

1213091C

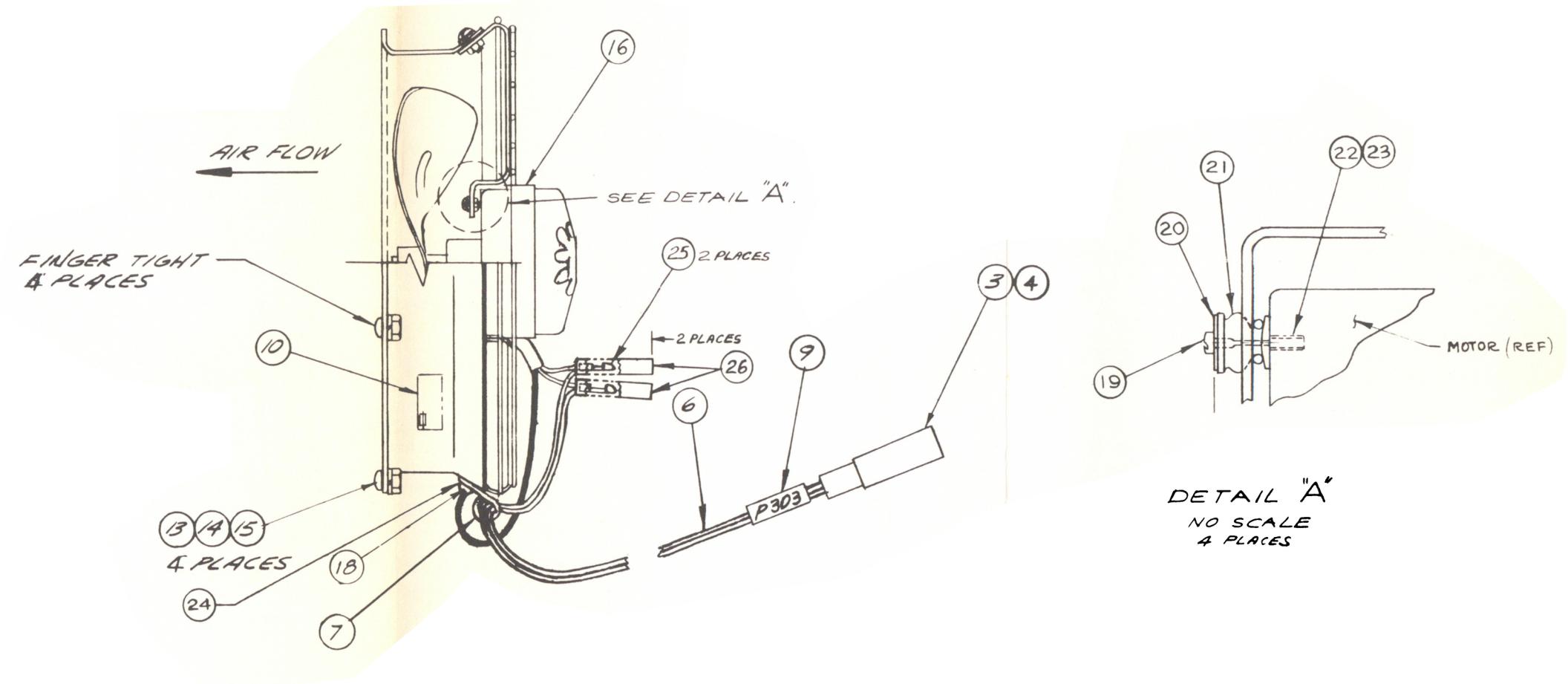
Transport Power Cable Assembly  
Dwg. No. 90810-12E



TRANSPORT POWER CABLE ASSEMBLY				CATALOG NO.	90810	Sheet 1 of 1									
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION		QUANTITY REQUIRED PER VERSION									
						-12									
1	B-90803-1			CABLE, 7 Conductor, #14		A/R									
2	144-091	DEUTSCH, DM 9702-1975-M or equivalent		CONNECTOR		1									
3	145-116	DEUTSCH, DM 9702-197P-1A or equivalent		CONNECTOR		1									
6	B-91944-2			BUSHING, Cable Clamp		2									
7	618-008			BRAID SHIELDING		A/R									
8	600-057			TUBING INSULATING, 1/2 ID		A/R									
11	600-090			TUBING, #10, thermofitting		A/R									

90810E

6.3-161/162



Fan Assembly  
Dwg. No. 1214813-04C

## FAN ASSEMBLY

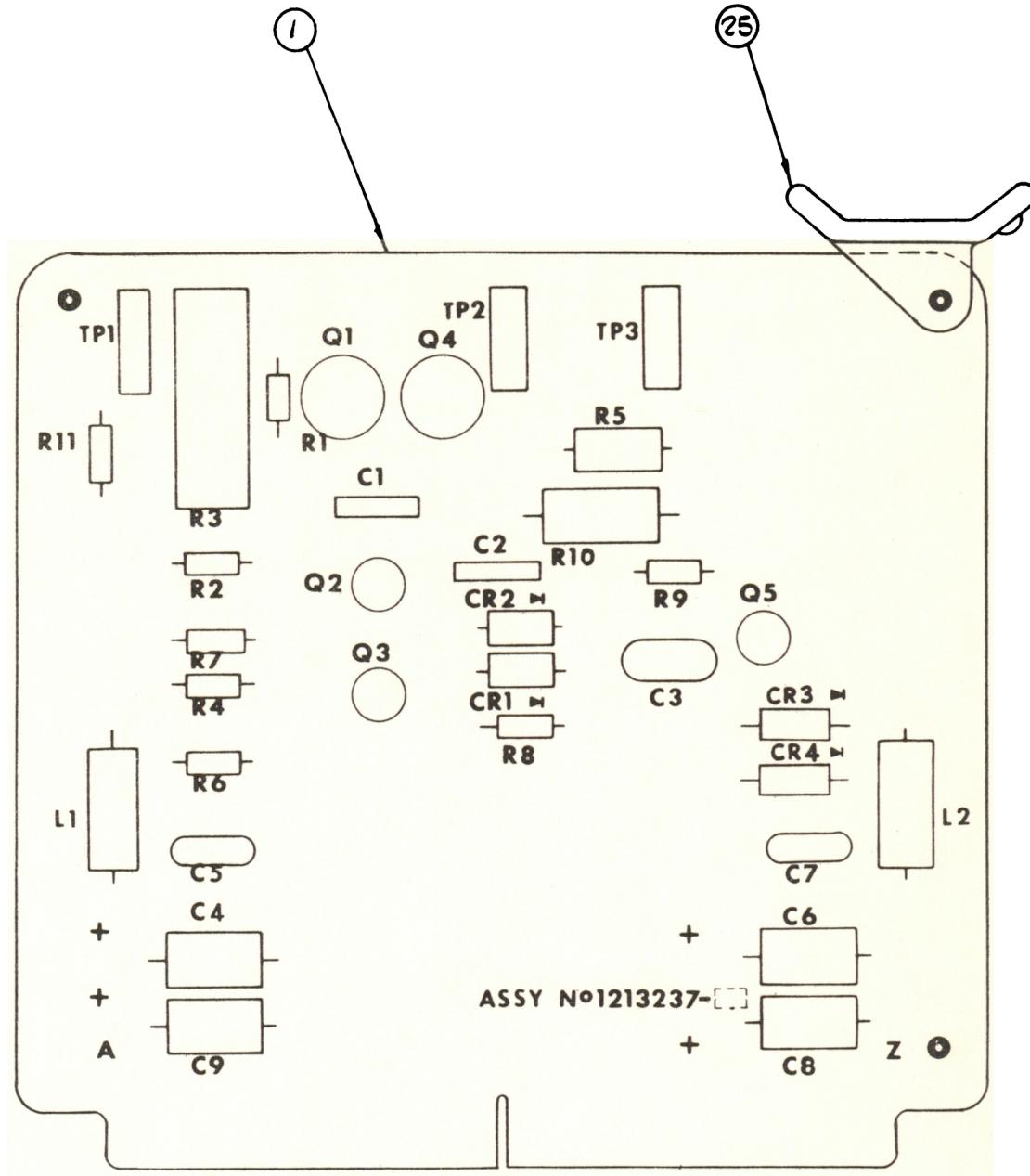
CATALOG NO. 1214813

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-04						
3	169-021		P303	CONNECTOR		1						
4	169-019			PIN, Contact, connector		2						
5	171-008			CONNECTOR, Solderless		4						
6	616-031			CABLE, 2 conductor		A/R						
7	302-028			CLAMP, Cable, 1/4 diameter		1						
10	6000022-10			IDENTIFICATION PLATE		1						
13	471-078			SCREW, Machine, pan head, 8-32 x 3/8		4						
14	502-004			WASHER, Spring Lock, #8		4						
15	492-010			NUT, Machine #8		4						
16	591-146			FAN		1						
18	471-079			SCREW, Machine, pan head, 8-32 x 7/16		1						
19	1244296-01			SCREW, Modified, #8-32 x 1" long		4						
20	501-024			WASHER, Flat, #8		4						
21	350-003			SHOCK MOUNT		4						
22	087-255			CLEANER, Locquic GR.Q or equivalent		A/R						
24	171-006			TERMINAL LUG, Solderless, #8		1						
25	171-984			CONNECTOR, Solderless, 14-16 wire		2						

1214813C

6.3-165/166



Variable Frequency Oscillator Printed Wiring Assembly  
Dwg. No. 1213237-01B

VARIABLE FREQUENCY OSCILLATOR PRINTED WIRING ASSEMBLY				CATALOG NO. 1213237	Sheet 1 of 1		
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
					-01		
1	1213236-01			PRINTED WIRING BOARD		1	
2	013-599	CD 458	CR1-4	DIODE, Silicon		4	
3	014-247	CD 38	Q1, 4	TRANSISTOR, Silicon, NPN		2	
4	014-505	CD 445	Q2, 3, 5	TRANSISTOR, Silicon, PNP		3	
5	030-057		C5, 7	CAPACITOR, Ceramic Disc, .01 $\mu$ f, 50v, $\pm 20\%$		2	
6	034-930		C3	CAPACITOR, Mica, .00068 $\mu$ f, 300v, $\pm 5\%$		1	
8	035-844		C1, 2	CAPACITOR, Mylar, .001 $\mu$ f, 50v, $\pm 10\%$		2	
9	037-137		C4, 6, 8, 9	CAPACITOR, Tantalum, electrolytic, 15 $\mu$ f, 15v, $\pm 20\%$		4	
11	041-343		R5	RESISTOR, Fixed, composition, 680 ohms, 1/2w, $\pm 5\%$		1	
12	041-396		R11	RESISTOR, Fixed, composition, 220 ohms, 1/4w, $\pm 5\%$		3	
13	041-412		R9	RESISTOR, Fixed, composition, 4700 ohms, 1/4w, $\pm 5\%$		1	
14	041-430		R8	RESISTOR, Fixed, composition, 1500 ohms, 1/4w, $\pm 5\%$		1	
15	041-550		R2, 4	RESISTOR, Fixed, carbon, 3000 ohms, 1/4w, $\pm 5\%$		2	
16	041-571		R7	RESISTOR, Fixed, composition, 3600 ohms, 1/4w, $\pm 5\%$		1	
17	041-102		R10	RESISTOR, Fixed, composition, 1000 ohms, 1w, $\pm 5\%$		1	
18	044-570		R3	RESISTOR, Variable, wirewound, 10K ohms, 1/2w, $\pm 10\%$		1	
19	051-094		L1, 2	INDUCTOR, 39 $\mu$ h, 500 ma maximum, $\pm 10\%$		2	
20	148-027		TP1	CONNECTOR, Printed Circuit, tip jack, horizontal, red		1	
21	148-028		TP2	CONNECTOR, Printed Circuit, tip jack, horizontal, white		1	
22	148-052		TP3	CONNECTOR, Printed Circuit, tip jack, horizontal, black		1	
23	280-130			TRANSISTOR, Pad		3	
24	280-131			TRANSISTOR, Pad		2	
25	1240695-05	J126		HANDLE, Card Ejector		1	
26		1213235		SCHEMATIC	REF		

1213237B

6.3-169/170

## CONVERSION KIT 1/2"

CATALOG NO. 1800548

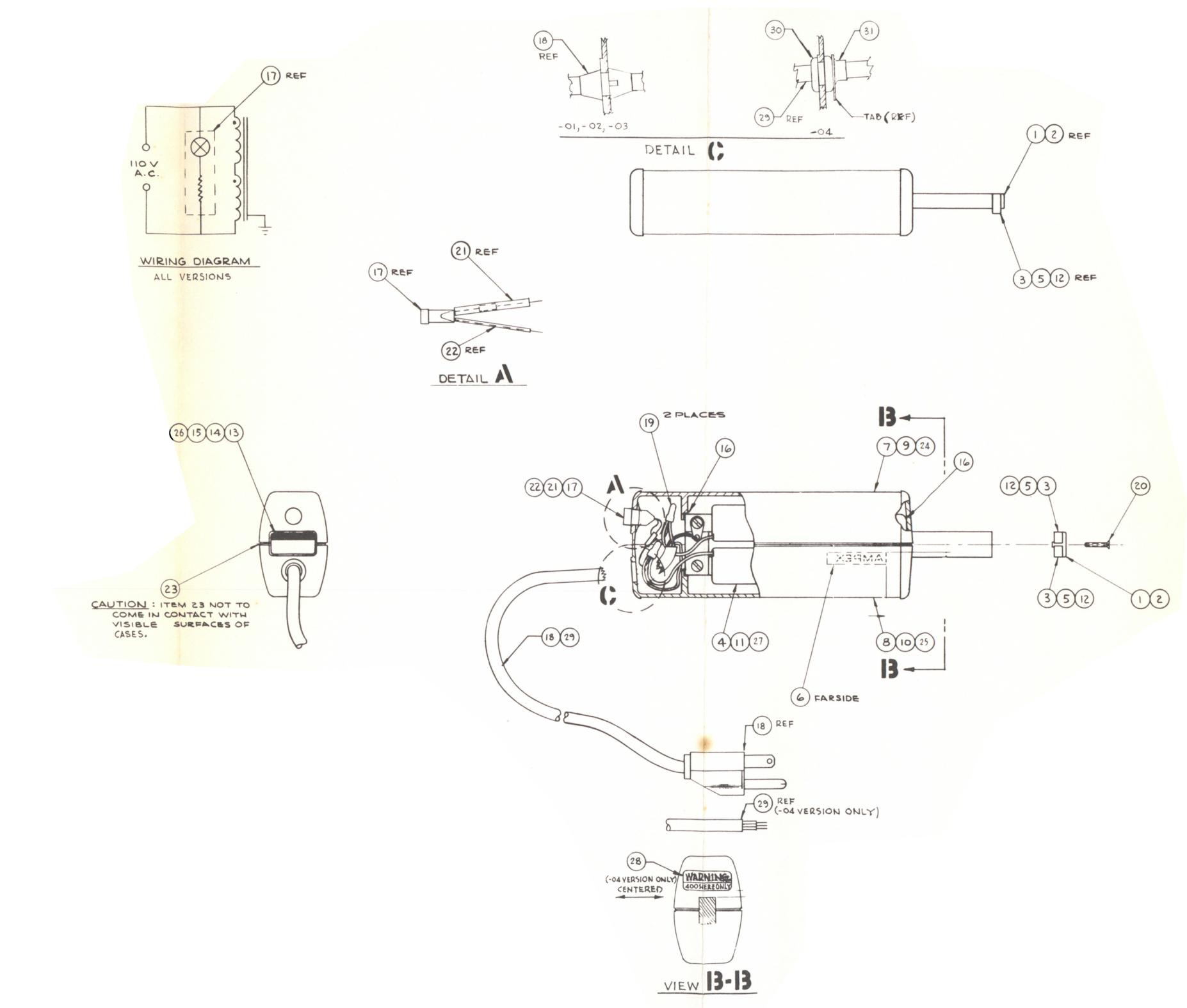
Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION							
						-02							
1	1212495-02			CAPSTAN			1						
3	470-042			SCREW, Socket, cap, 10-32 x 1"			4						
4	502-005			WASHER, #10, springlock			4						
5	1213208-04			PLENUM, 1/2"			2						

1800548A

CONVERSION KIT 1"				CATALOG NO.	1800547	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-03						
1	1212495-02			CAPSTAN		1						
3	470-106			SCREW, Socket, cap, 10-32 x 1-1/2"		6						
4	502-005			WASHER, #10, Springlock		6						
6	1244344-05			PLENUM, 1"		1						
7	1244344-06			PLENUM, 1"		1						
Note 1: Protective packaging is required.												

1800547B



Degausser Final Assembly  
Dwg. No. 1815050-01-02-03A

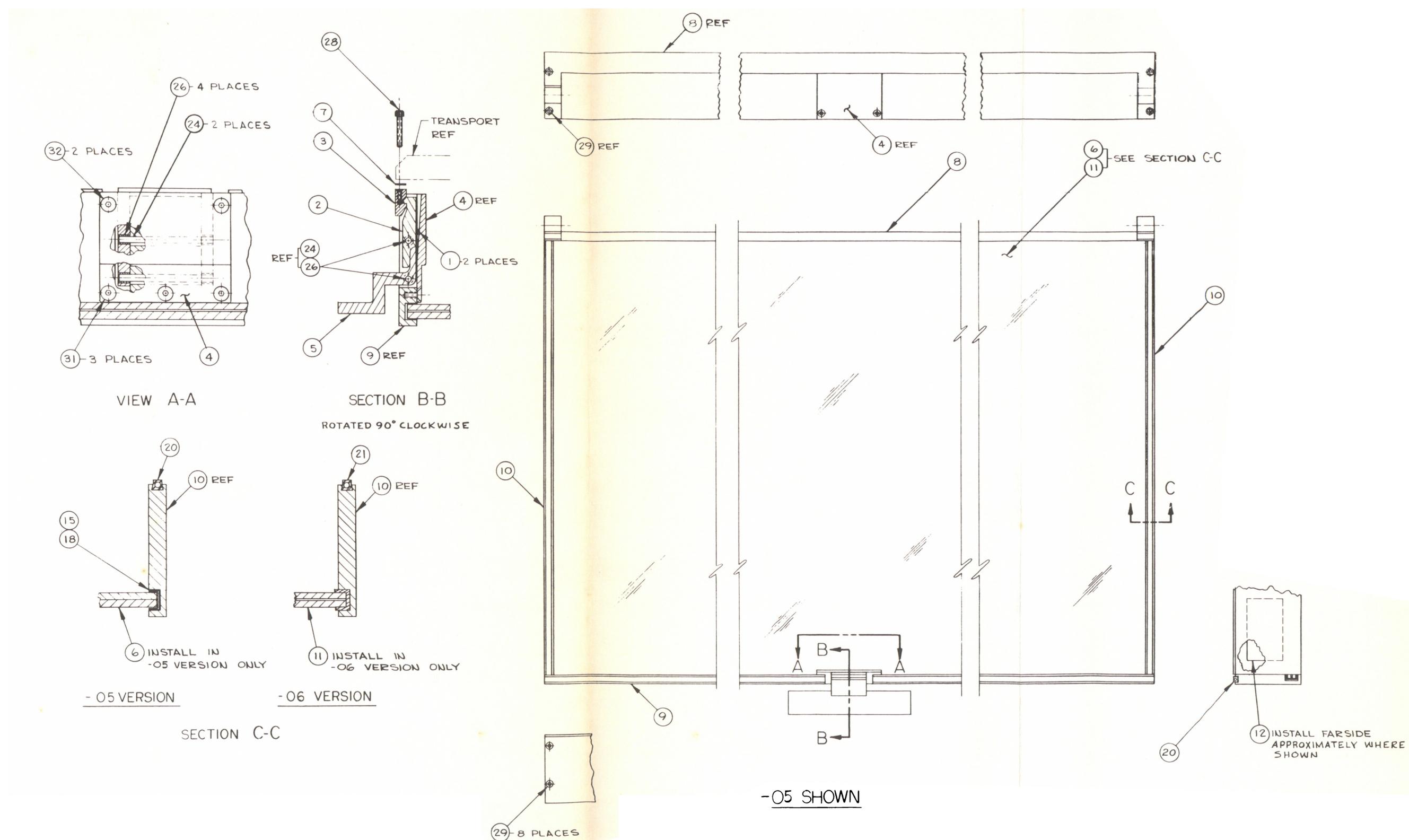
## DEGAUSSER FINAL ASSEMBLY

CATALOG NO. 1815050

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION		
					-01	-02	-03
1	1231633-01			POLE CAP	1	1	-
2	1231633-02			POLE CAP	-	-	1
3	1231634-01	FR 1600		POLE	2	-	-
4	1231635-01			DEGAUSSER, Sub-Assembly	1	1	-
5	1231647-01	FR 1800 H		POLE	-	2	-
6	1231815-01			NAMEPLATE, Trademark	1	1	1
7	1231823-01			CASE, Degausser	1	1	-
8	1231823-02			CASE, Degausser	1	1	-
9	1231823-03			CASE, Degausser	-	-	1
10	1231823-04			DEGAUSSER, Sub-Assembly	-	-	1
11	1231899-01			DEGAUSSER, Sub-Assembly	-	-	1
12	1231930-01	AR 1600		POLE	-	-	2
13	1240998-01			LABEL	1	-	-
14	1240998-02			LABEL	-	1	-
15	1240998-03			LABEL	-	-	1
16		GE RTV 102		ADHESIVE, Silicon Rubber	A/R	A/R	A/R
17	132-096			LAMP	1	1	1
18	084-031			CORD	1	1	1
19	171-041			CONNECTOR, Solderless, splicing	2	2	2
20	472-472			SCREW, Machine, flat head, #2-56x1/2	1	1	1

1815050A



Transport Door Assembly  
Dwg. No. 1212785-05-06C

## TRANSPORT DOOR ASSEMBLY

CATALOG NO. 1212785

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-05	-06				
1	90024-10			SPRING, Latch		2	2				
2	90037-11			LATCH		1	1				
3	90038-11			STRIKE		1	1				
4	90039-11			PLATE, Latch		1	1				
5	90040-11			HANDLE		1	1				
6	90041-10			GLASS		1	-				
7	90258-10			SPACER, Latch Strike		3	3				
8	1212783-03			STRIP, Hinge Side		1	1				
9	1212889-01			STRIP, Latch Side		1	1				
10	1212890-01			STRIP, Top and Bottom		2	2				
11	1212913-01			WINDOW, RFI Shielded		-	1				
12	6000022-10			NAMEPLATE, Identification		1	1				
15	018-009			ADHESIVE, Resin, elastomer liquid, fuel resistant	A/R	-					
16	018-027			ADHESIVE, Thread Locking Compound	A/R	A/R					
18	225-004			TAPE ADHESIVE, Rubber, black, electrical 3/8 wide	A/R	-					
20	269-090			RUBBER EXTRUSION, 7/32 x 1/4 wide	A/R	-					
21	1205004-10			GASKET, RF		-	A/R				
24	402-022			PIN, Dowel, .1250 diameter x 2.00 long		2	2				
26	423-032			BEARING, Sleeve, plain, .1265 x .1895 OD x .250 long		4	4				
28	470-013			SCREW, Cap, hex, socket, 4-40 x 5/8 long		3	3				
29	470-029			SCREW, Cap, hex, socket, 8-32 x 1/2 long		8	8				
31	471-776			SCREW, Machine, flat head, hex drive, 6-32 x 1/4 long		3	3				
32	471-785			SCREW, Machine, flat head, hex drive, 6-32 x 3/8 long		2	2				

1212785C

6.3-181/182

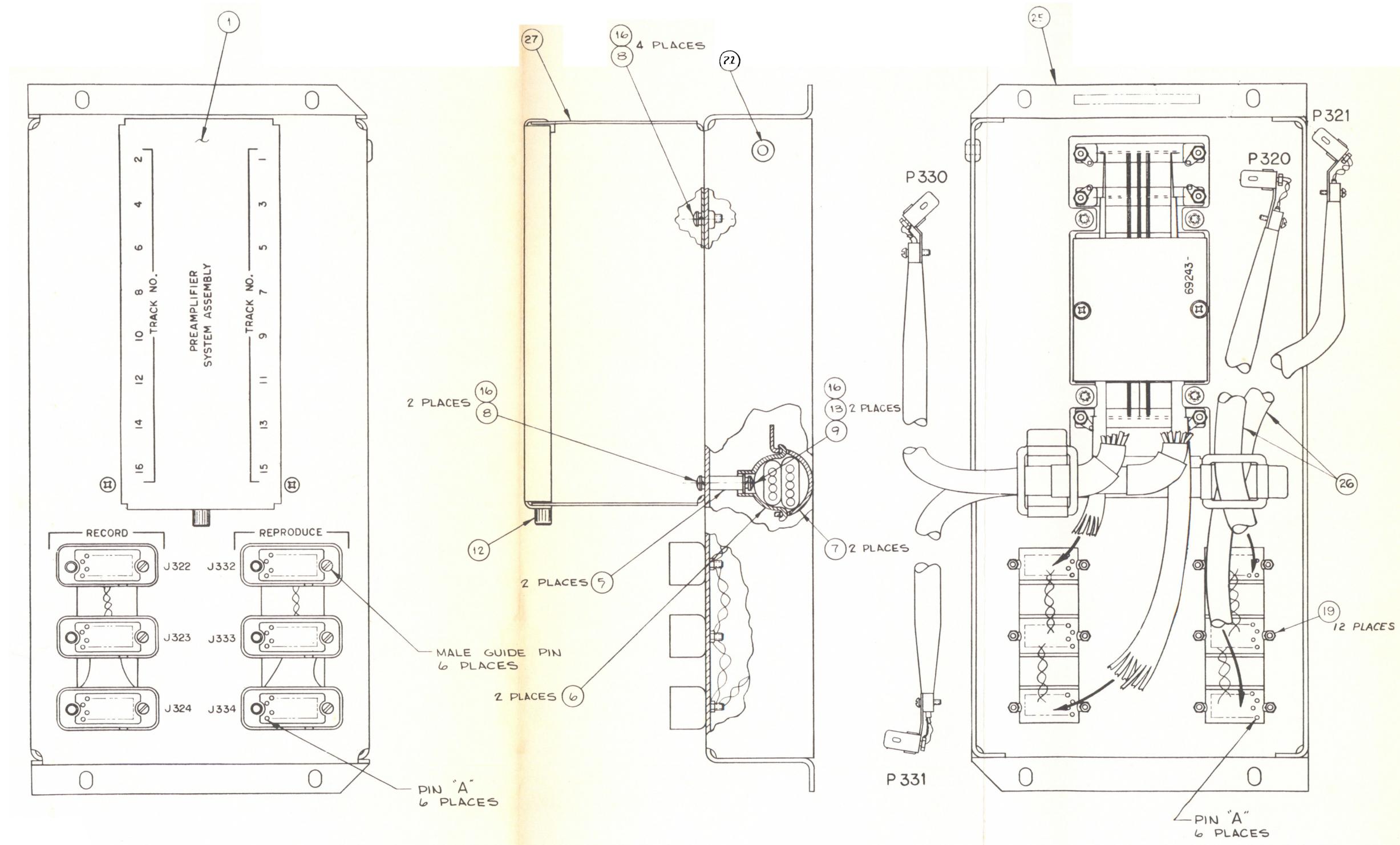
## SPECIAL PURPOSE ELECTRICAL CABLE ASSEMBLY

CATALOG NO. 48921-1

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION							
						-1							
2	145-105	Deutsch DM9702 7PLA		CONNECTOR		2							

48921C

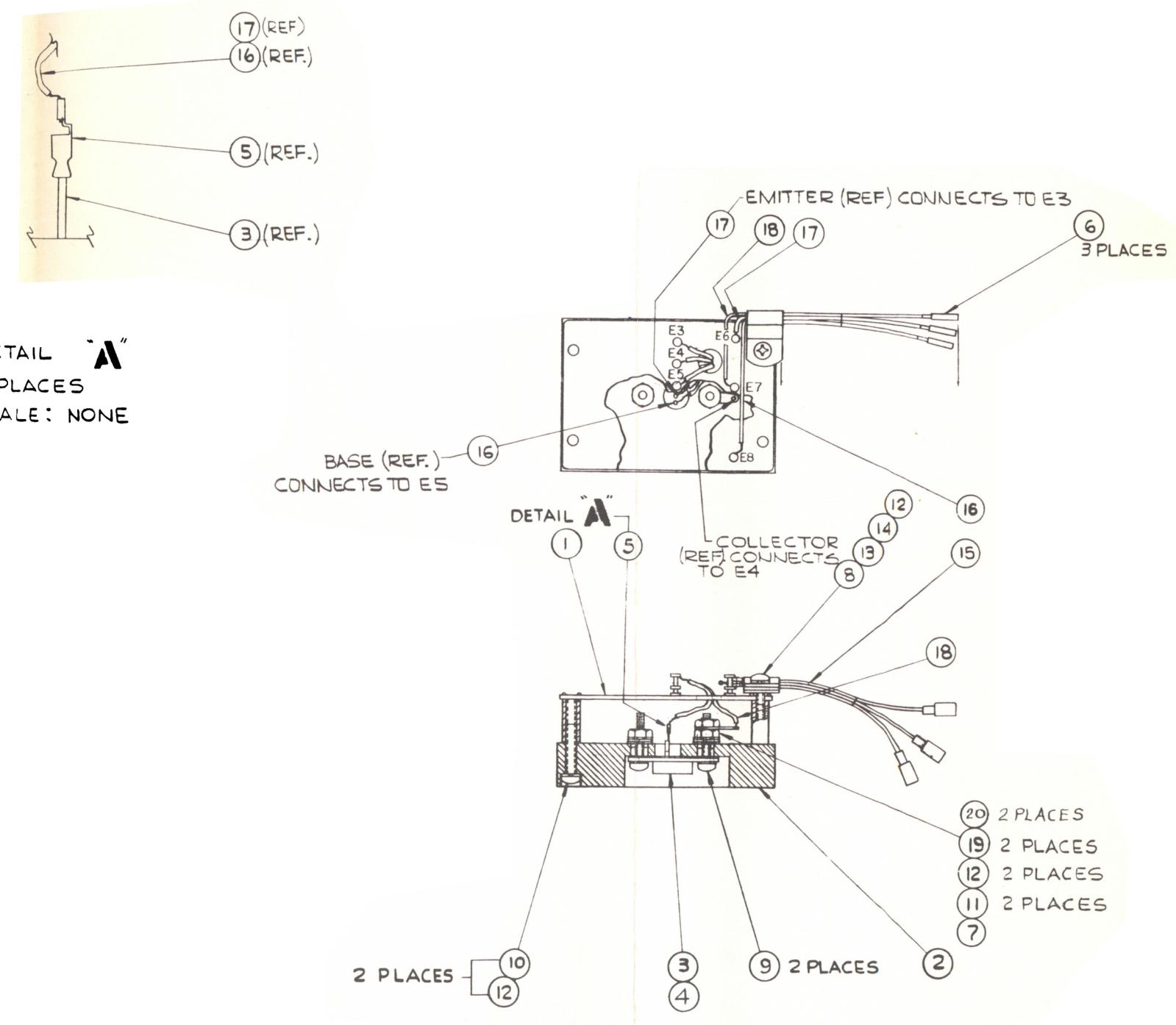


**Reproduce Preamplifier (Head Cables) Assembly**  
**Dwg. No. 1800697-02C**

HEAD CABLES AND REPRODUCE PREAMPLIFIER ASSEMBLY				CATALOG NO.	1800697	Sheet 1 of 1				
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION				
					-04					
1	69213-30			COVER, Preamplifier Box		1				
5	280-025			SPACER, Thread, 6-32 x 1/4 OD x 3/4 long		2				
6	302-062			CLIP, Cradle, 1-3/8 diameter x 3/4 high		2				
7	302-067			CLIP, Cradle, extensible, 1" size		2				
8	471-069			SCREW, Machine, cross recessed, pan head, 6-32 x 3/8 long		6				
9	471-071			SCREW, Machine, cross recessed, pan head, 6-32 x 1/2 long		2				
10	471-089			SCREW, Machine, cross recessed, pan head, 10-32 x 1/2 long		4				
11	472-107			SCREW, Machine, cross recessed, pan head, 2-56 x 1/4 long, stainless steel		4				
12	474-091			SCREW, Thumb, 6-32		1				
13	501-009			WASHER, Flat, #6		2				
14	501-011			WASHER, Flat, #10		4				
15	501-013			WASHER, Flat, #2, stainless steel		4				
16	502-003			WASHER, Lock Spring, #6		8				
17	502-005			WASHER, Lock, spring, #10		4				
19	501-110			WASHER, Flat, #4, stainless steel		12				
21	502-029			WASHER, Lock, Flat, internal tooth, #2		4				
22	260-005			GROMMET, 5/16 ID		1				
25	1240747-02			CHASSIS		1				
26	1240743-03			HEAD CABLE ASSEMBLY, Record		1				
27	1240745-04			HOUSING ASSEMBLY, Reproduce Preamplifier		1				

1800697C

6.3-187/188



Solenoid Control Assembly  
Dwg. No. 1240472-02-03B

## MOTOR SWITCH ASSEMBLY

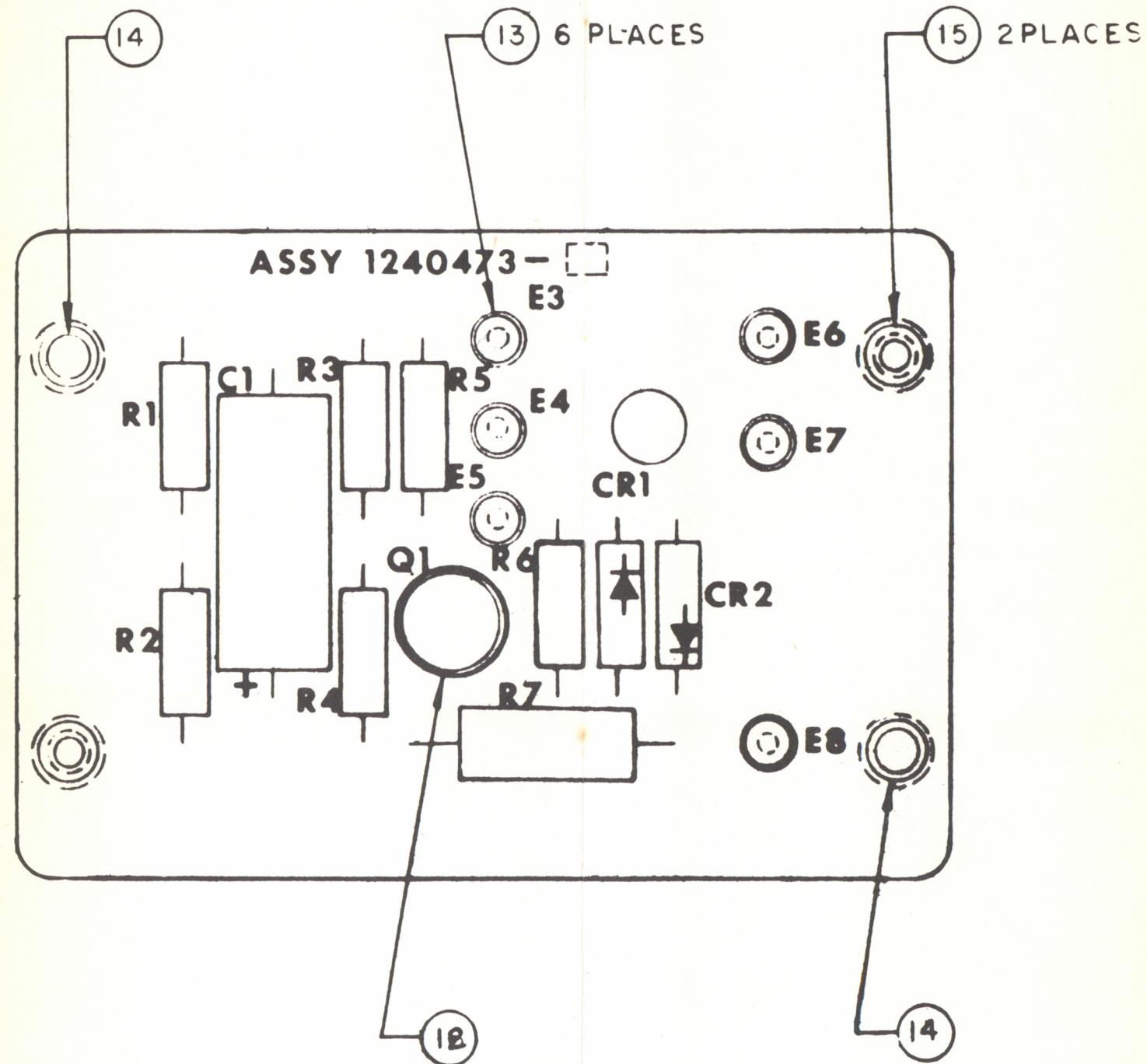
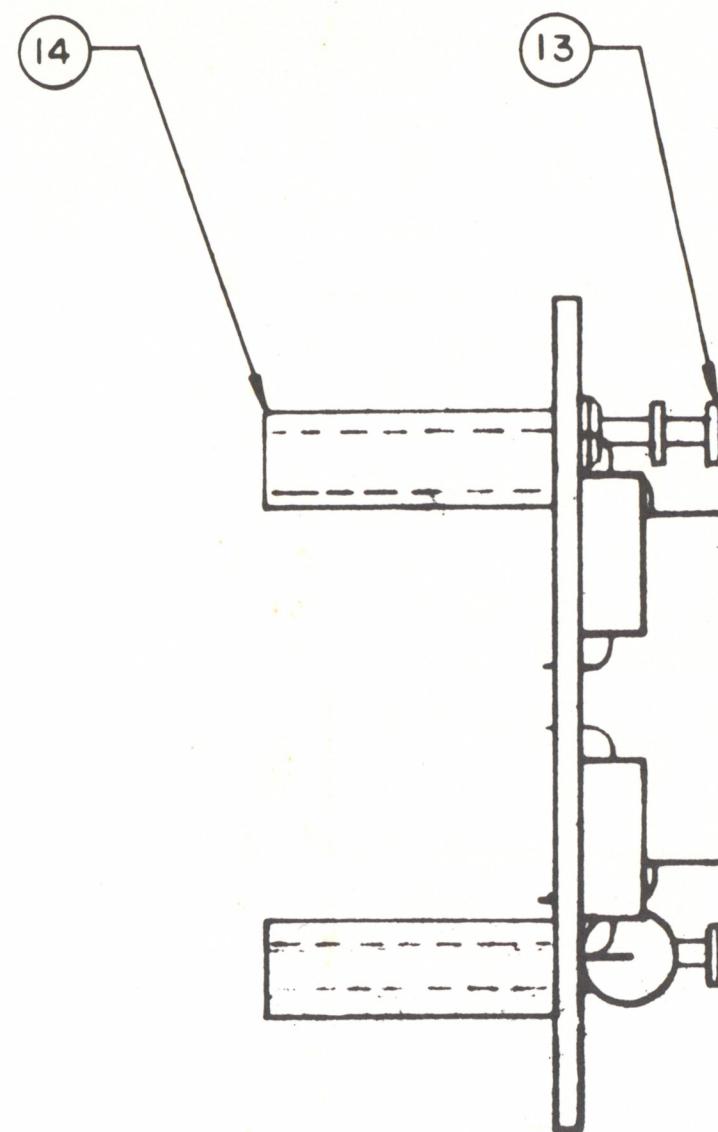
CATALOG NO. 1240472

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION	
					-02	-03
1	1240473-02			SOLENOID CONTROL CIRCUIT ASSEMBLY	1	-
2	1240476-01			HEAT SINK	1	1
3	014-587			TRANSISTOR, Silicon, NPN	1	1
4	087-388			THERMAL COMPOUND	A/R	A/R
5	169-976			CONNECTOR, Solderless	2	2
6	171-239			TERMINAL, Lug	3	3
7	172-010			LUG, Solder, #6	1	1
8	471-068			SCREW, Recessed, pan head, 6-32 x 5-16	1	1
9	471-072			SCREW, Recessed, pan head, 6-32 x 5/8	2	2
10	471-073			SCREW, Recessed, pan head, 6-32 x 3/4	2	2
11	492-009			NUT, Hex, #6	3	3
12	502-003			WASHER, Spring Lock, #6	5	5
13	506-013			WASHER, Cable Clamp, #6	1	1
14	302-031			CABLE, Clamp, 3/16	1	1
15	600-012			SLEEVING, Clear, #7, 0.148 ID	A/R	A/R
16	611-048			WIRE, Insulated, #22, black	A/R	A/R
17	611-050			WIRE, Insulated, #22, red	A/R	A/R
18	611-057			WIRE, Insulated, #22, white	A/R	A/R
19	501-009			WASHER, Flat, #6	2	2
20	503-019			WASHER, Flat, non-metallic, #6	2	2
21		1240475		SCHEMATIC	REF	REF
22	1240473-03			SOLENOID CONTROL CIRCUIT ASSEMBLY	-	1

1240472 B

6.3-191/192



Solenoid Control Circuit Assembly  
Dwg. No. 1240473-03D

## SOLENOID CONTROL CIRCUIT ASSEMBLY

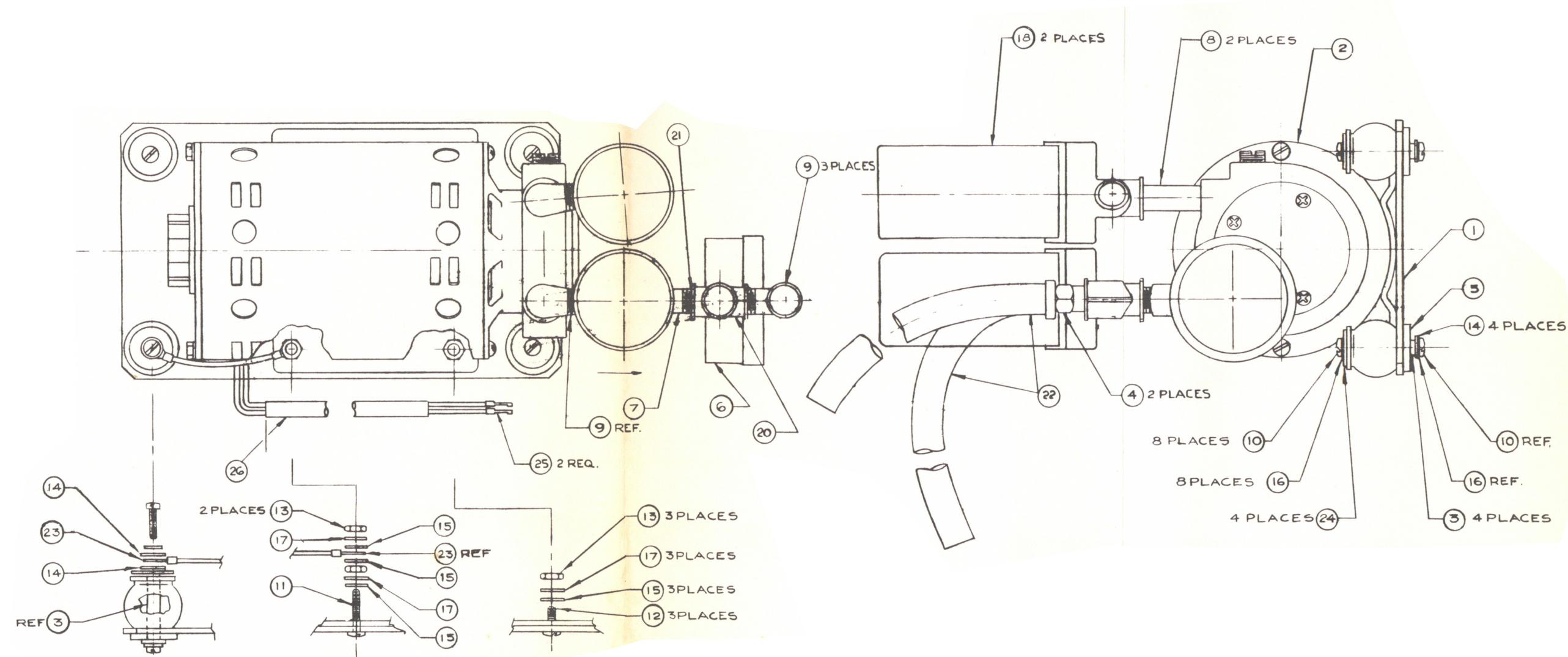
CATALOG NO. 1240473

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION		REF	REF
					-02	-03		
1				PRINTED WIRING BOARD	1	1		
2	013-678	CD451	CR1, 2	DIODE	2	2		
3	014-364	CD438	Q1	SEMICONDUCTOR, Transistor, silicon, PNP	1	1		
4	041-322		R3	RESISTOR, Fixed, composition, 48 K, 1/2w, 5%	1	1		
5	041-361		R4	RESISTOR, Fixed, composition, 7.5 K, 1/2w, 5%	1	-		
6	041-283		R6	RESISTOR, Fixed, composition, 74 ohms, 1/2w, 5%	1	1		
7	041-343		R5	RESISTOR, Fixed, composition, 680 ohms, 1/2w, 5%	1	1		
8	041-331		R2	RESISTOR, Fixed, composition, 3300 ohms, 1/2w, 5%	1	1		
9	041-885		R7	RESISTOR, Fixed, composition, 200 ohms, 1w, 5%	1	1		
10	041-329		R1	RESISTOR, Fixed, composition, 330 ohms, 1/2w, 5%	1	1		
11	037-241		C1	CAPACITOR, Tantalum 100 $\mu$ f, 20v	1	1		
12	280-131			TRANSISTOR, Pad	1	1		
13	173-015		E3, 4, 5, 6, 7, 8	TURRET TERMINAL	6	6		
14	173-101			STANDOFF	2	2		
15	280-024			STANDOFF	2	2		
16			1240475	SCHEMATIC				
17	041-373		R4	RESISTOR, 9.1 K, 1/2w, 5%	-	1		

1240473C

6.3-195/196

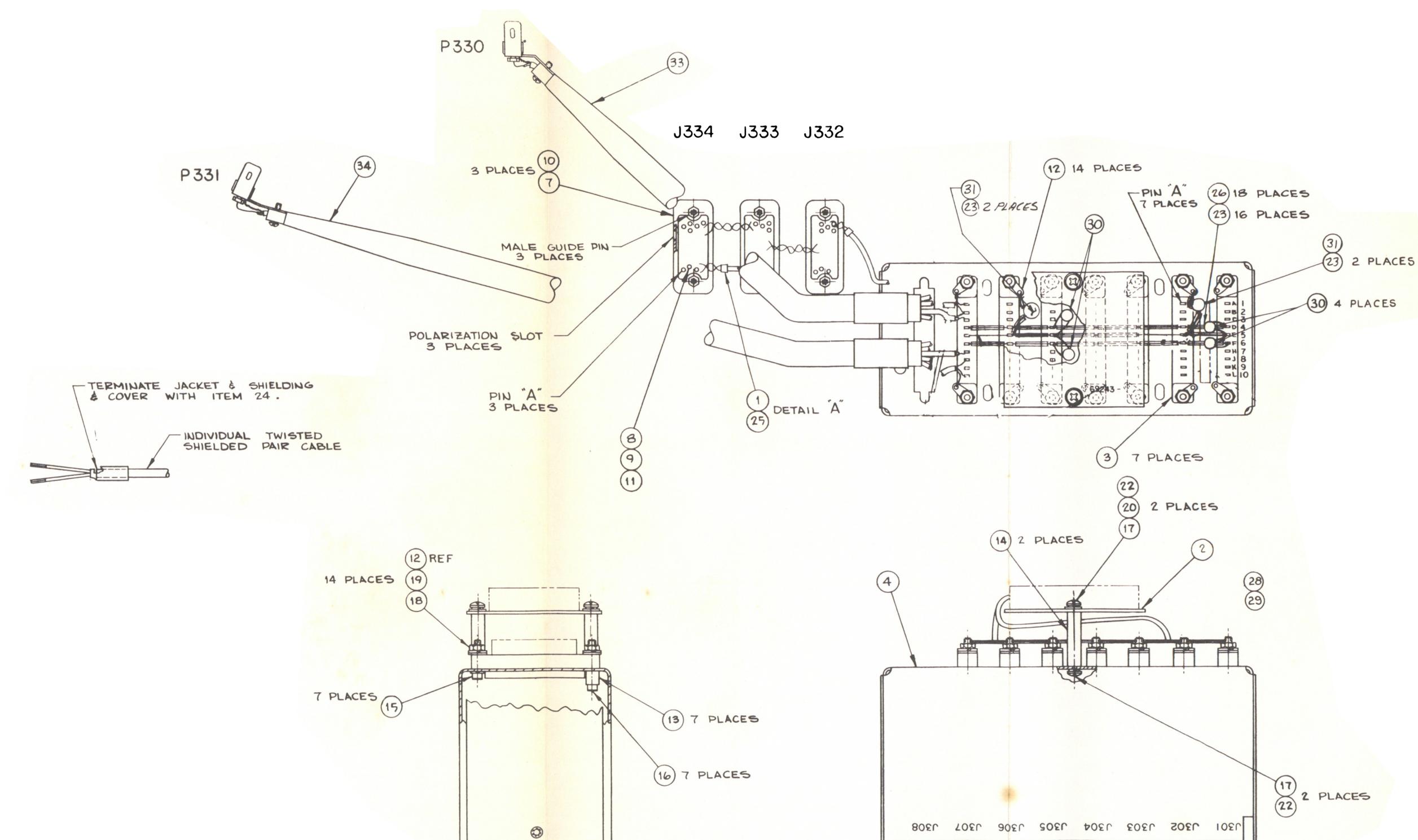


Compressor Assembly  
Dwg. No. 1244322-01

COMPRESSOR ASSEMBLY				CATALOG NO. 1244322	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
					-01						
1	168104-02			BASE PLATE, Vacuum Pump		1					
2	168213-02			PUMP ASSEMBLY		1					
3	280-988			SPACER, Threaded, 1/4 x 1		4					
4	281-046			COUPLING		2					
5	350-034			BALLMOUNT		4					
6	090-023			GAUGE		1					
7	440-103			COUPLING, 1/8 NPT x 3/4 long		1					
8	440-124			COUPLING, 1/8 NPT x 1-1/2 long, male ends		2					
9	440-129			ELBOW, 90°		3					
10	471-496			SCREW, Machine, pan head, 6-32 x 1/2		8					
11	472-133			SCREW, Machine, pan head, 10-32 x 3/4		1					
12	472-909			SCREW, Machine, pan head, 10-32 x 7/16		3					
13	492-011			NUT, Hex, #10		5					
14	501-009			WASHER, Flat, #6		6					
15	501-011			WASHER, Flat, #10		6					
16	502-025			WASHER, Lock, #6		8					
17	502-027			WASHER, Lock, #10		5					
18	370-041			FILTER & MUFFLER ASSEMBLY		2					
20	440-151			CROSS, 1/8 NPT		1					
21	225-193			TAPE-UNITE PIPE JOINT COMPOUND, 1/2 Wd.		A/R					
22	601-013			HOSE, 1/4 ID		A/R					
23	1244325-01			GROUND STRAP		1					
24	1244324-01			WASHER, Shock Mount		4					
25	171-009			KNIFE, Disconnect		2					
26	600-027			TUBING, #2, black		A/R					

1244322

6.3-199/200

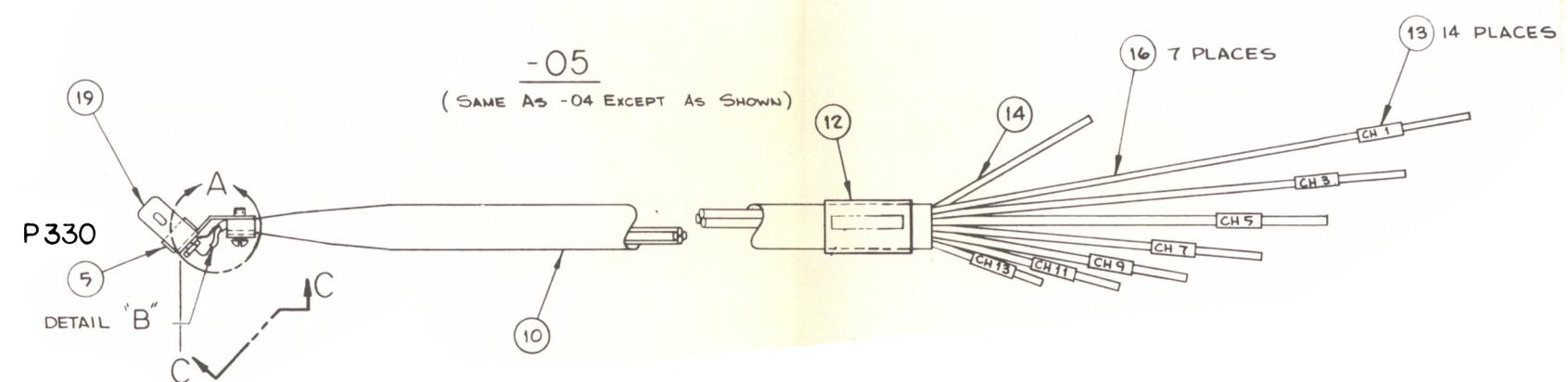
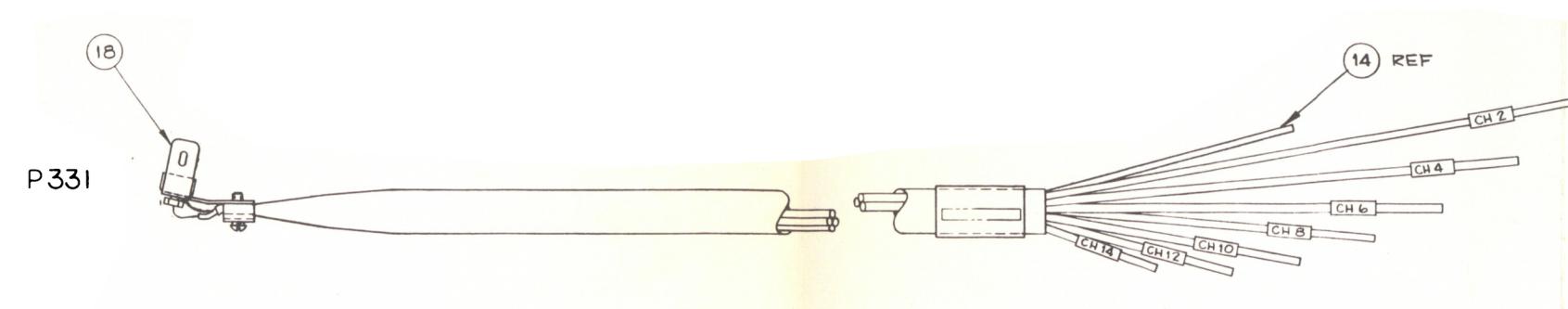


**Reproduce Preamplifier Housing Assembly  
Dwg. No. 1240745-01-03C**

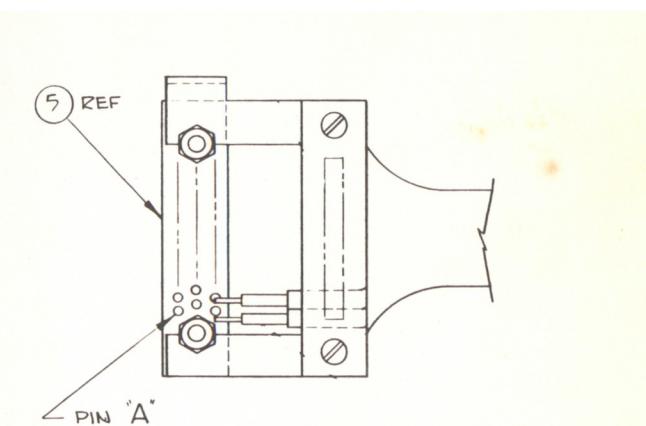
REPRODUCE PREAMPLIFIER HOUSING ASSEMBLY				CATALOG NO.	1240745	Sheet 1 of 1		
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION		
						-04		
1	69223-10			CABLE, Special Purpose, electrical, specification, magnetic head cabling	A/R			
2	69243-10			ASSEMBLY, Preamplifier Filter	1			
3	69246-10	J301 thru J307		EDGE CONNECTOR, Etched Wiring, 10 contacts	7			
4	1240748-01			FRAME ASSEMBLY	1			
7	146-184	J332 thru J334		CONNECTOR, Receptacle, 26 socket, female	3			
8	169-076			CONTACT, Socket, connector, #20 AWG	6			
9	169-085			CONTACT, Socket, connector, #24 AWG	30			
10	169-113			SHELL, Connector, polarized, at "C"	3			
11	169-144			CONTACT, Socket, connector, #22 AWG	19			
12	172-004			TERMINAL LUG, Solder, lock, #4	14			
13	280-002			SPACER, Plain, 9/64 ID x 1/4 OD x 1/4 long	7			
14	280-988			SPACER, Threaded, 6-32 internal thread x 1/4 OD x 1.00 long	2			
15	470-012			SCREW, Cap, hex socket, 4-40 x 1/2 long	7			
16	470-014			SCREW, Cap, hex socket, 4-40 x 3/4 long	7			
17	471-069			SCREW, Machine, cross recessed, pan head, 6-32 x 3/8 long	4			
18	492-008			NUT, Hex, 4-40	14			
19	501-008			WASHER, Flat, #4	14			
20	501-009			WASHER, Flat, #6	2			
22	502-025			WASHER, Lock, flat, internal tooth, #6	4			
27		1240753		SCHEMATIC, Head Cables and Reproduce Preamplifier Assembly	REF			
30	030-057	C3,4,5,6		CAPACITOR, .01 $\mu$ f, 50v	4			
31	030-135	C1,2		CAPACITOR, .05 $\mu$ f, 50v	2			
33	1240750-04			HEAD CABLE ASSEMBLY, Reproduce	1			
34	1240750-05			HEAD CABLE ASSEMBLY, Reproduce	1			

1240745C

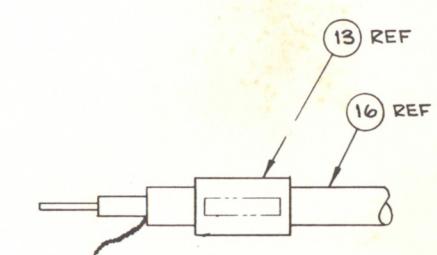
6.3-203/204



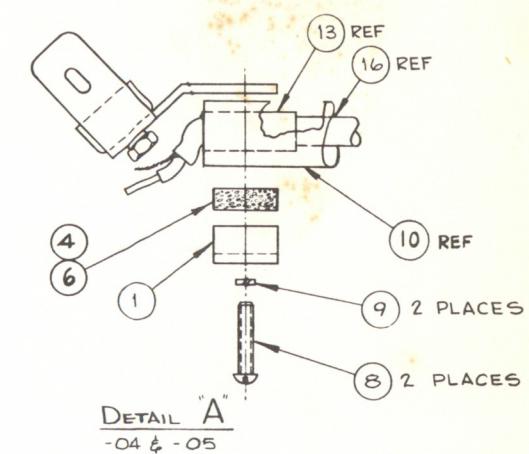
- 04



VIEW C-C



DETAIL "B"



**Reproduce Head Cable Assembly  
Dwg. No. 1240750-01-03B**

## REPRODUCE HEAD CABLE ASSEMBLY

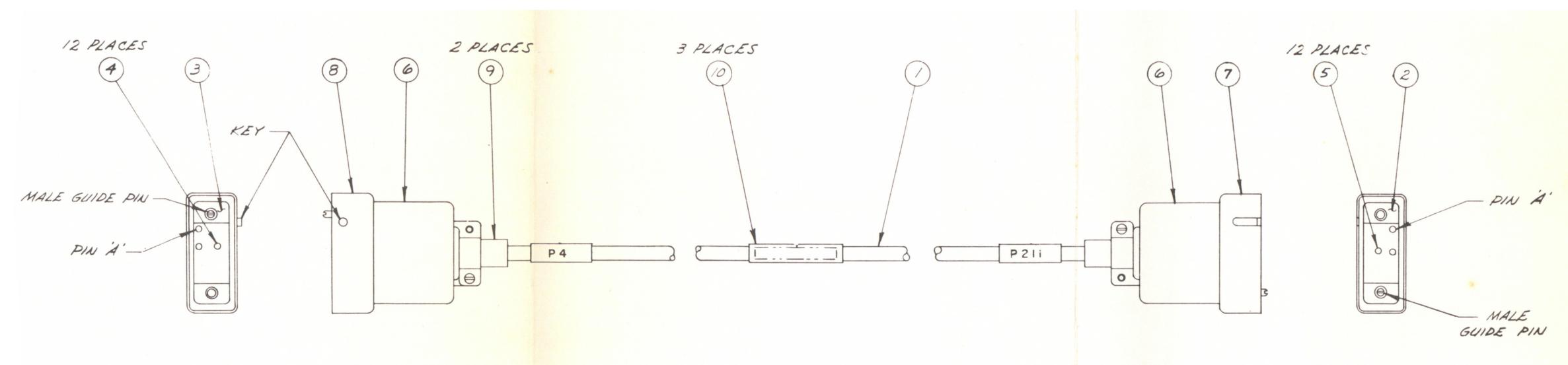
CATALOG NO. 1240750

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION						
						-05						
1	1214584-01			CLAMP, Shielding and Cable Head		1						
5	146-129	P330, 331		CONNECTOR, Rectangular, receptacle, 20 socket		1						
6	269-028			RUBBER, Sponge, .125 thick	A/R							
8	471-505			SCREW, Machine, slotted, round head, 2-56 x 3/8 long		2						
9	502-001			WASHER, Lock, spring, #2		2						
16	616-396			CABLE, RF, Coaxial	A/R							
17		1240753		SCHEMATIC, Head Cables and Reproduce Preamplifier Assembly	A/R							
18	1214585-10			RETAINER, Connector Head		1						

1240750B

6.3-207/208

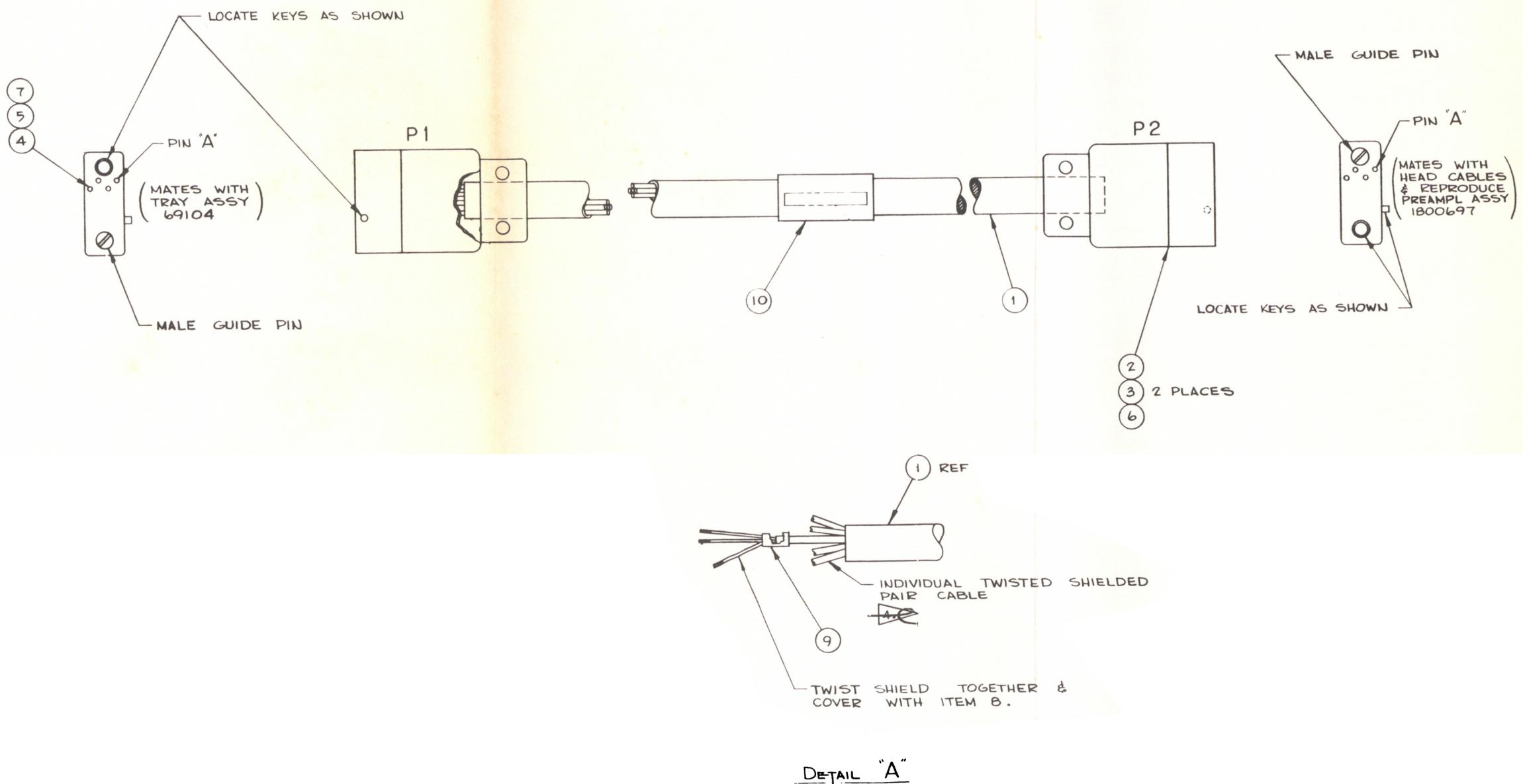


Electronics Power and Control Cable Assembly  
Dwg. No. 1241564-01

POWER AND CONTROL ELECTRONICS CABLE ASSEMBLY				CATALOG NO.	1241564	Sheet 1 of 1	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-01	
1	90820-10			CABLE, 14 Connector, #22 AWG	A/R		
2	145-173	MRAC 26-P-G7		CONNECTOR, Receptacle, male		1	
3	146-184	MRAC 26-S-G7		CONNECTOR, Receptacle, female		1	
4	169-076			CONTACT, Female, #20 crimp type, insertable		12	
5	169-078			CONTACT, Male, #20 crimp type, insertable		12	
6	169-126			HOOD, Connector, cable clamp		2	
7	169-128			SHELL, Receptacle, connector		1	
8	169-129			SHELL, Plug, connector		1	
9	262-003			BUSHING, Telescoping	A/R		

1241564D

6.3-211/212

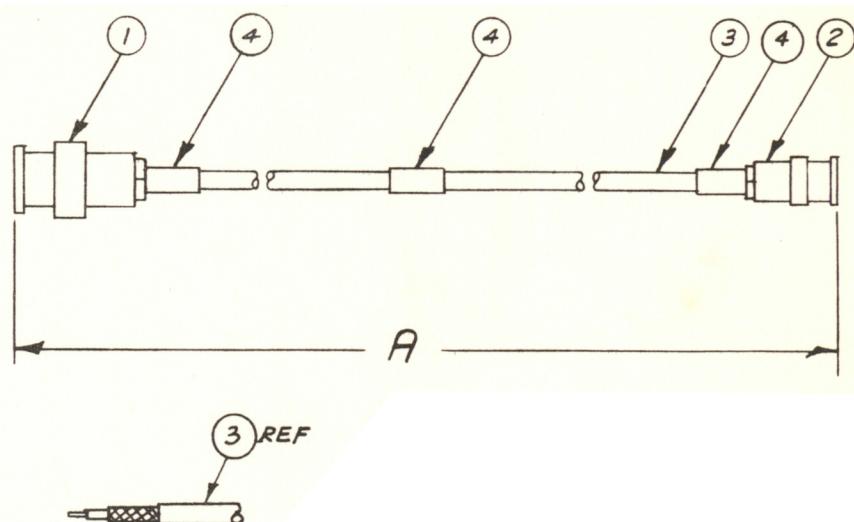


Record-Reproduce Signal Cable Assembly  
Dwg. No. 1800698-02A

SIGNAL RECORD/REPRODUCE CABLE ASSEMBLY				CATALOG NO. 1800698	Sheet 1 of 1						
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION						
					-02						
2	1205053-10			HOOD, Connector, modified	2						
3	145-173		P1, 2	HOUSING, Connector, plug, male, 26 contacts	2						
4	169-077			CONTACT, Connector Pin, crimp, 0.062 diameter, wire, #16	16						
5	169-086			CONTACT, Pin, connector, wire, #24	32						
6	169-127			SHELL, Plug, connector	2						
7	169-143			CONTACT, Pin, connector, male, wire, #22	4						
8	600-021			TUBING, Non-Metallic, 0.066 ID, clear	A/R						
9	600-090			TUBING, Non-Metallic, electrical insulated sleeve, black, #12	A/R						
10	600-097			TUBING, Non-Metallic, electrical insulated sleeve, black, 3/4 ID	A/R						

1800698A

6.3-215/216

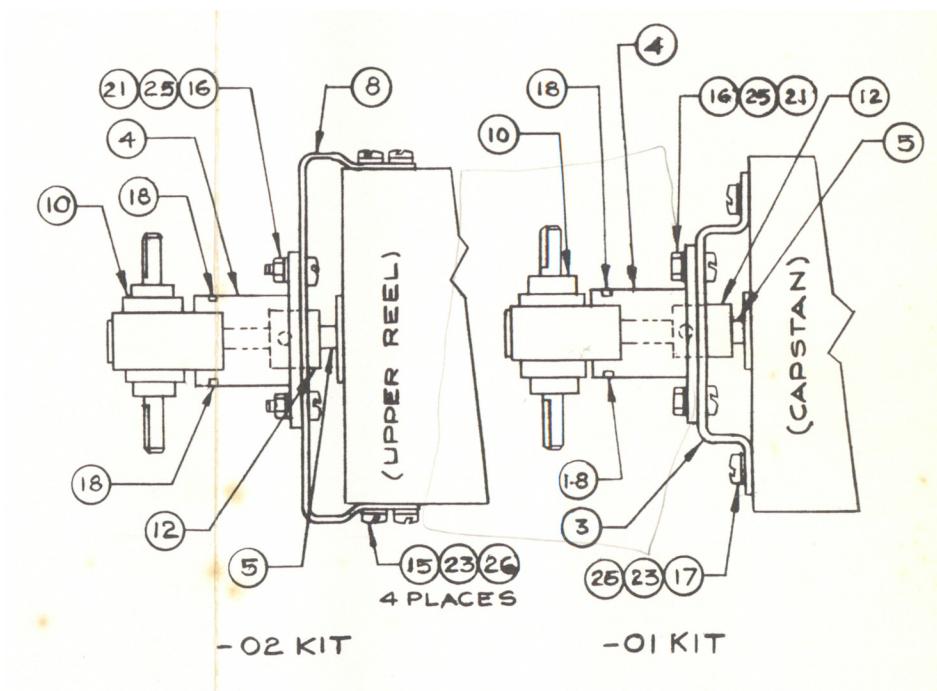
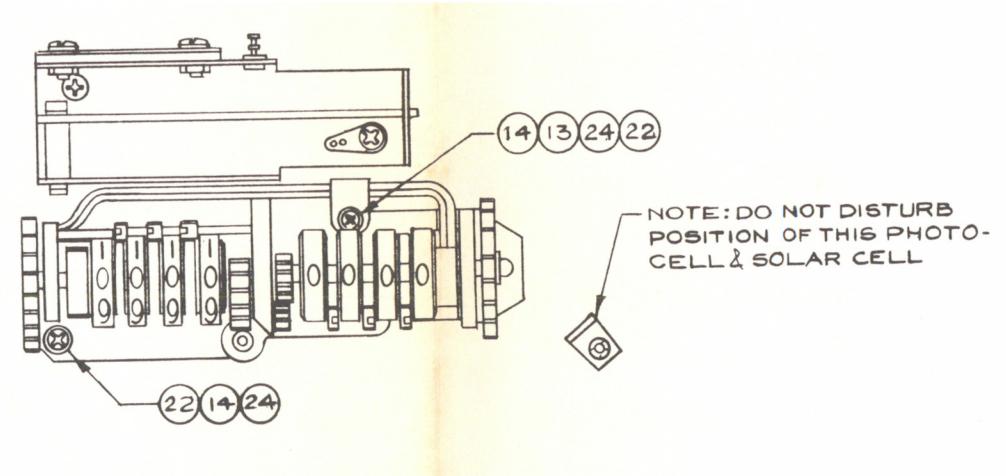
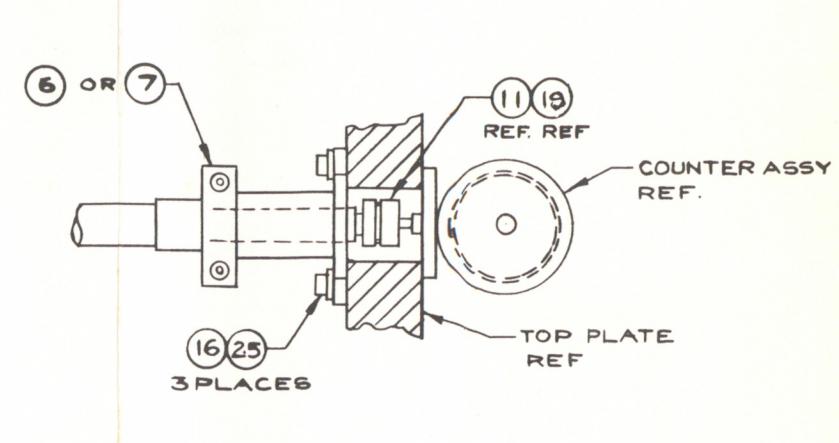
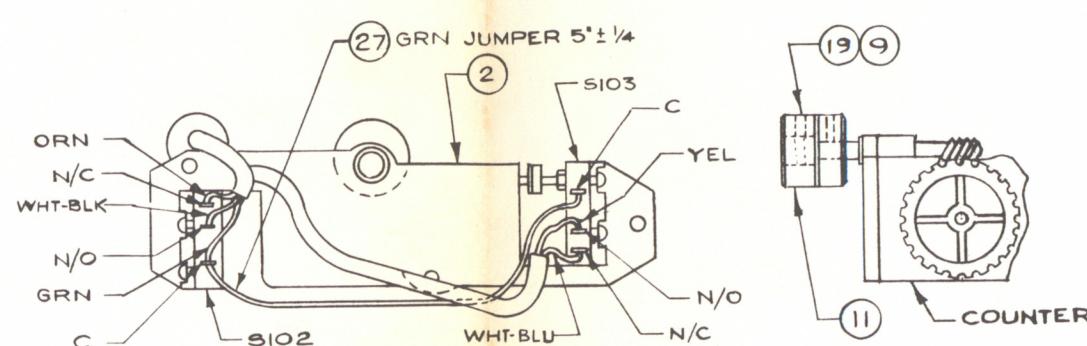


Signal Interconnecting Cable Assembly  
Dwg. No. 69231-10 thru -80E

CABLE ASSEMBLY				CATALOG NO.	Sheet 1 of 1							
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	QUANTITY REQUIRED PER VERSION							
					-10	-20	-30	-40	-50	-60	-70	-80
1	145-295	Amphenol 31-352 or Equivalent		CONNECTOR, Plug, male, BNC	1	1	1	1	1	1	1	1
2	143-079			CONNECTOR, Plug, female, miniature, BNC	1	1	1	1	1	1	1	1

69231E

6.3-219/220

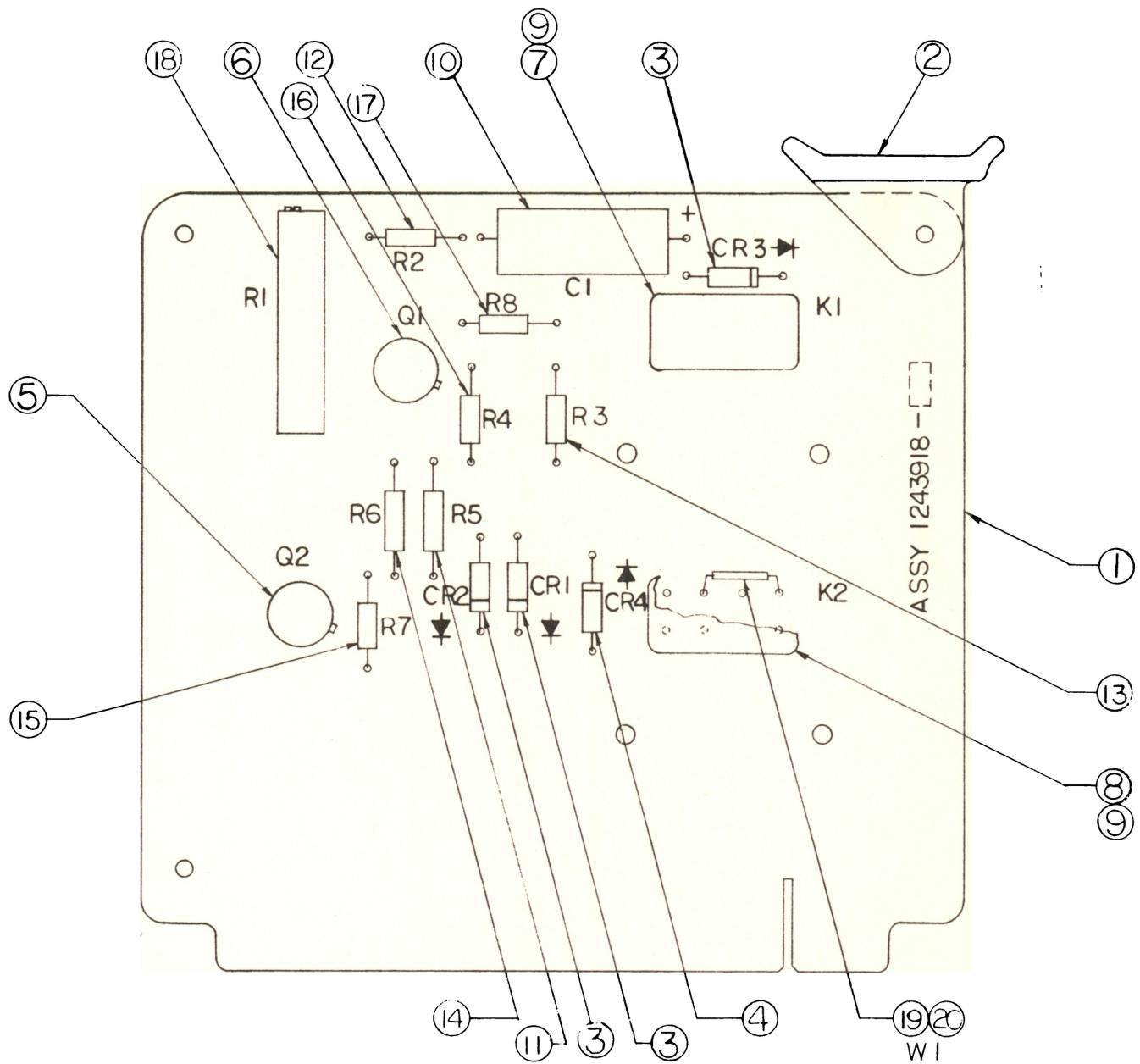


Reel Rotation Counter Kit  
Dwg. No. 1244099-01-02

REEL ROTATION AND FOOTAGE COUNTER KIT				CATALOG NO.	1244099	Sheet 1 of 1	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-01	-02
1	1240825-03	7XA9056C		COVER COUNTER		1	1
2	1240986-02			REEL ROTATION COUNTER		1	1
3	1243960-01			BRACKET, Capstan Mounting		1	-
4	1243961-01			TEE DRIVE MOUNT		1	1
5	1243964-01			MOTOR SHAFT ADAPTER		1	1
6	1243975-01			SHAFT ASSEMBLY, Counter Extension		1	-
7	1243975-02			SHAFT ASSEMBLY, Counter Extension		-	1
8	1243976-01			BRACKET, Mounting		-	1
9	018-028			ADHESIVE, Loctite, grade A		A/R	A/R
10	088-050			DUAL TEE DRIVE		1	1
11	281-054			MIDGET FLEXIBLE COUPLING, MC, 1/4 x 1/8		1	1
12	281-157			MIDGET FLEXIBLE COUPLING, MC, 1/4 x 1/4		1	1
13	302-031			CABLE CLAMP, 3/16" Diameter, plastic		1	1
14	470-012			SCREW, Pan Head, 4-40 x .500 long		2	2
15	470-037			SCREW, Cap, hex socket, #10 - 32 x 7/16		-	4
16	471-073			SCREW, Pan Head, 6-32 x .375		7	7
17	472-415			SCREW, Pan Head, #10-24 x .375 long		2	-
18	477-005			SET SCREW, 4.40 x .25 long		2	2
19	477-007			SET SCREW, 4.40 x 3/8 long		1	1
21	496-005			NUT, 6-32 Keps		4	4
22	501-021			WASHER, Flat, #4		2	2
23	501-203			WASHER, Flat, #10		2	4
24	502-002			WASHER, Lock, #4-40		2	2
25	502-003			WASHER, Spring Lock, #6		7	7
26	502-005			WASHER, Spring Lock, #10		2	4

1244099

6.3-223/224

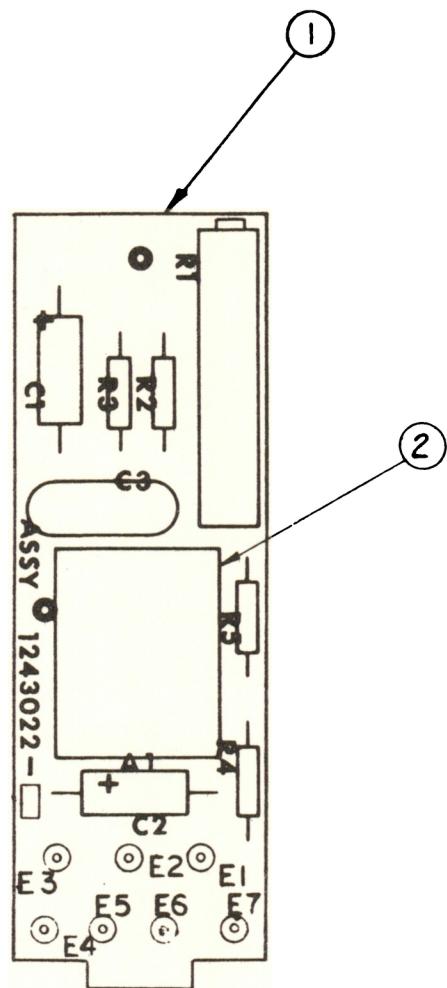


Time Delay Circuit Printed Wiring Assembly  
Dwg. No. 1243918-01-02

TIME DELAY CIRCUIT PRINTED WIRING ASSEMBLY				CATALOG NO.	1243918	Sheet 1 of 1	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-01	-02
1	1243919-01			PRINTED WIRING BOARD		1	1
2	1240695-10			HANDLE, Card Ejector		1	1
3	013-678	CD 451	CR1,2,3	DIODE, Silicon		3	3
4	013-678	CD 451	CR4	DIODE, Silicon		-	1
5	014-247	CD 38	Q2	SCOND-TRANSISTOR, Silicon		1	1
6	014-364	CD 438	Q1	SCOND-TRANSISTOR, Silicon		1	1
7	020-425		K1	RELAY		1	1
8	020-425		K2	RELAY		-	1
9	020-438			SPACER		1	2
10	037-241		C1	CAPACITOR, Tantalum, 100 $\mu$ f, 20v, 20%		1	1
11	041-010		R5	RESISTOR, Fixed, composition, 1/2w, 2000 ohms, $\pm 5\%$		1	1
12	041-409		R2	RESISTOR, Fixed, composition, 1/4w, 15K ohms, $\pm 5\%$		1	1
13	041-428		R3	RESISTOR, Fixed, composition, 1/4w, 470 ohms, $\pm 5\%$		1	1
14	041-525		R6	RESISTOR, Fixed, composition, 1/2w, 3600 ohms, $\pm 5\%$		1	1
15	041-531		R7	RESISTOR, Fixed, composition, 1/4w, 750 ohms, $\pm 5\%$		1	1
16	041-733		R4	RESISTOR, Fixed, composition, 1/4w, 56 ohms, $\pm 5\%$		1	1
17	041-765		R8	RESISTOR, Fixed, composition, 1/4w, 510K ohms, $\pm 5\%$		1	1
18	044-961		R1	RESISTOR, Variable, carbon, 1/4w 100K ohms, $\pm 20\%$		1	1
21		1243920		SCHEMATIC	REF	-	
22		1243921		SCHEMATIC	-	REF	

1243918

6.3-227/228



Tape Position Sensor Printed Wiring Assembly  
Dwg. No. 1243022-02B

## TAPE POSITION SENSOR PRINTED WIRING ASSEMBLY

CATALOG NO. 1243022

Sheet 1 of 1

ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION					
						-02					
1	1243023-01			PRINTED WIRING BOARD		1					
2	1212074-02			SPACER, Operational Amplifier		1					
3	037-137	C1, 2		CAPACITOR, Tantalum, 15 $\mu$ f, 15v, 20%		2					
4	034-153	C3		CAPACITOR, Mica, .001 $\mu$ f, 500v, 5%		1					
5	044-290	R1		RESISTOR, Variable, 10K, 1/4w, 20%		1					
6	041-443	R2		RESISTOR, Fixed, 39K, 1/4w, 5%		1					
7	041-754	R3		RESISTOR, Fixed, 91K, 1/4w, 5%		1					
8	041-427	R4		RESISTOR, Fixed, 330 ohms, 1/4w, 5%		1					
9	041-407	R5		RESISTOR, Fixed, 3300 ohms, 1/4w, 5%		1					
11	1212070-02	A1		OPERATIONAL AMPLIFIER ASSEMBLY		1					
12		1243024		SCHEMATIC DIAGRAM		REF					

1243022B

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VOICE LOG KIT				CATALOG NO.	1800733	Sheet 1 of 1	
ITEM NO.	AMPEX PART NO.	VENDOR OR MIL. NO.	SCHEMATIC REFERENCE	PART DESCRIPTION	MFR. CODE	QUANTITY REQUIRED PER VERSION	
						-05	-06
1	69115-20			VOICE LOG MODULE		1	1
2	1213283-01			MICROPHONE, Dynamic		1	1
3	1212160-01			TRAY, Speaker Panel Assembly		1	1
4	1243270-01			CABLE ASSEMBLY, Voice Log		1	1
7	1243570			INSTALLATION INSTRUCTIONS, Voice Log Kit		1	1
10	1244418-01			PLENUM ASSEMBLY, 1"		1	-
11	1244418-02			PLENUM ASSEMBLY, 1/2"		-	1

1800733B

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**APPENDIX A**

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## APPENDIX A

1A-1. INTRODUCTION. In accordance with customer specifications, the FR-1800L Recorder/Reproducer is modified as discussed in the following paragraphs. Information in this appendix supersedes any conflicting information elsewhere in this manual.

1A-2. GENERAL INFORMATION.

1A-3. GENERAL DESCRIPTION.

1A-4. The recorder/reproducer consists basically of a tape transport, a system control bay, two ES-100 multispeed record signal electronics trays, two ES-100 multispeed reproduce signal electronics trays, fourteen each ES-100 multispeed direct record and reproduce signal electronics modules, fourteen each ES-100 fm record and reproduce signal electronics modules, and various accessory components. See figure 1A-1 for a rack cabinet layout diagram.

1A-5. DESCRIPTION OF SPECIAL FEATURES AND COMPONENTS.

1A-6. In addition to the features and capabilities described in preceding portions of this instruction manual, the FR-1800L Recorder/Reproducer has the following features:

(1) the recorder/reproducer can operate in any of three modes of broken tape sensing, two modes which stop tape motion when either a clear window of tape is sensed or the tape breaks, and a third mode which ignores clear windows in the tape less than eight inches in length; and (2) controls for selection of either new standard (normal) or old standard fm center carrier frequencies for the fm record and reproduce signal electronics modules for all tape speeds except 1-7/8 ips.

1A-7. The three modes of broken tape sensing allow the recording or reproducing of tapes which have clear windows from six to eight inches in length throughout the tape and clear leaders at the beginning and end of reel. The normal or old standard fm center carrier frequency selection feature enables the reproduction of tapes recorded on equipment using old standard fm center carrier frequencies as well as the recording of new tapes which may be reproduced on equipment using old standard fm center carrier frequencies.

1A-8. In order to provide the capabilities described above, there are photo-electric sensors in the center of the upper and lower plenum chambers of the tape transport, logic relays (K111 through K116) inside the system control bay, an OVERRIDE pushbutton on the front control panel of the system control bay, and the NORM/OLD STD switch, the BROKEN TAPE MODE switch, and the E.O.T. STOP switch on the inside control panel of the system control bay.

1A-9. INSTALLATION.

1A-10. Refer to Chapter 2 of this manual for installation information. No special installation procedures are required to install this recorder/reproducer.

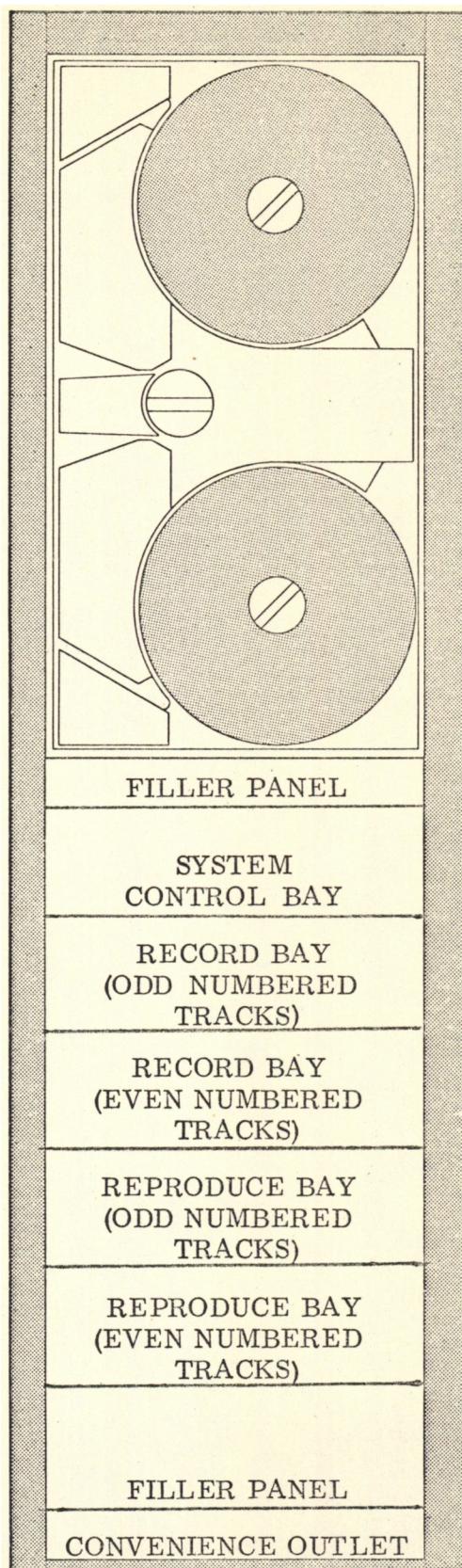


Figure 1A-1. Rack Layout for FR-1800L Recorder/Reproducer

**1A-11. OPERATION.****1A-12. GENERAL INFORMATION.**

1A-13. The following paragraphs contain operating information for the recorder/reproducer supplementary to that contained in Chapter 3 of the manual.

**1A-14. CONTROLS AND INDICATORS.**

1A-15. Controls and indicators not included in Chapter 3 of this manual are described in table 1A-1.

Table 1A-1. System Control Bay Controls and Indicators

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
OVERRIDE	S14	A pushbutton located adjacent to the STOP pushbutton on the front panel of the system control bay. This pushbutton is used at the beginning or end of reel when long sections of clear leader must be passed through the plenums. Before attempting operation using the OVERRIDE pushbutton, become familiar with the operating procedures and precautions listed in paragraph 1A-16.
E. O. T. STOP	S20	A toggle switch with two positions. In the NORMAL position the end of reel sensors stop tape motion when approximately 1/8 inch of tape pack remains on the reel. In the DEFEAT position the end of tape sensors are disabled and the tape transport is controlled by the broken tape sensors and the circuits associated with the BROKEN TAPE MODE switch S15, described below. The E.O.T. STOP switch is placed in the DEFEAT position in order that the tape transport will not stop when 1/8 inch of tape pack remains but will continue operation until the clear leader at the beginning or end of reel is sensed.

Table 1A-1. System Control Bay Controls and Indicators (Cont)

CONTROL OR INDICATOR	REFERENCE DESIGNATION	FUNCTION
BROKEN TAPE MODE	S15	A three-position toggle switch used to select the manner in which the tape transport reacts to clear sections of tape, six to eight inches in length.
STANDARD position		Power is removed from the tape transport any time a clear section of tape of any length is sensed, or the tape breaks.
IGNORE WINDOW position		Clear sections of tape less than eight inches in length are ignored by the sensors. Power is removed from the tape transport when a clear section of tape longer than eight inches is sensed, or the tape breaks.
SENSE WINDOW position		When a clear section of tape from six to eight inches in length is sensed, the tape transport enters the stop mode. If a clear section of tape longer than eight inches in length is sensed or the tape breaks, power is removed from the tape transport.
NORM/OLD STD	S20	A two-position toggle switch used to select either normal (new standard) or old standard fm center carrier frequencies in the fm record and fm reproduce signal electronics modules. The normal and old standard center carrier frequencies for each tape speed are listed in table 1A-2.
NORMAL/ SEARCH	S15	A two-position toggle switch that is placed in the NORMAL position during normal operation. In the SEARCH position the tape transport operates in the forward or reverse drive modes at 120 ips tape speed when the fast forward or fast reverse mode is selected.

**1A-16. OPERATING PROCEDURES.**

1A-17. The following paragraphs contain information concerning operation in the three modes of broken tape sensing of standard, ignore window, and sense window and presents operating procedures and precautions which must be adhered to when using the controls listed in table 1A-1.

**1A-18. STANDARD BROKEN TAPE MODE.**

1A-19. If the BROKEN TAPE MODE switch is in the STANDARD position, tape transport power will turn off when a six inch clear section of tape is sensed. If the tape is moving fast enough, the clear section will coast entirely past the sensing areas and onto the takeup reel. Then, it is only necessary to press the POWER ON pushbutton to restore operation. However, if the tape is travelling slowly, the clear section may come to a halt in the sensing area at the entrance to the plenum chamber. In this case, it is necessary to move the tape manually until the window is no longer in the plenum chamber before operation may be restored by depressing the POWER ON pushbutton.

1A-20. IGNORE WINDOW BROKEN TAPE MODE. With the BROKEN TAPE MODE switch in the IGNORE WINDOW position, a clear section of tape six to eight inches in length will not be sensed and the tape transport will continue normal operation. If a clear section of tape longer than eight inches in length is sensed, or the tape breaks, power to the tape transport is turned off.

1A-21. SENSE WINDOW BROKEN TAPE MODE. With the BROKEN TAPE MODE switch in the SENSE WINDOW position, the tape transport will enter the stop mode when a six inch clear section of tape is sensed. To resume operation, depress and hold the selected command pushbutton until the clear window is moved out of plenums. If a clear section of tape longer than eight inches in length is sensed, or the tape breaks, power to the tape transport is turned off.

1A-22. E.O.T. STOP SWITCH. NORMAL OR DEFEAT SELECTION. With the E.O.T. STOP switch in the NORMAL position, the end of reel sensors will stop the tape transport when approximately 1/8 inch of tape pack remains on the reel. To empty the reel depress and hold the FORWARD or REVERSE pushbutton until tape is wound completely off the reel.

1A-23. With the E.O.T. STOP switch in the DEFEAT position, the tape transport will stop at the clear leader at the beginning or end of reel. At tape speeds of 120 ips and lower the tape transport will stop the tape within the 32 feet of clear leader, but at higher tape speeds encountered during fast forward or fast reverse modes the clear leader will be wound off of the tape reel. To empty the tape reel when clear leader must be pulled through the plenums, use the OVERRIDE pushbutton as described below.

1A-24. USE OF THE OVERRIDE PUSHBUTTON. The OVERRIDE pushbutton is used when it is necessary to pull long sections of clear leader at the beginning or end of reel through the plenum chambers. The OVERRIDE pushbutton is used in conjunction with either the FAST FORWARD, FAST REVERSE, FORWARD, or REVERSE pushbutton (depending upon desired direction of tape travel) to provide a mode in which the reel servos and broken tape sensors are disabled thus allowing the tape transport to operate using clear tape. In order to avoid tape damage during this mode, the following equipment power turn-off procedures must be observed.

1A-25. Do not hold the OVERRIDE pushbutton depressed any longer than necessary to wind the clear leader onto or off of the reel. If the tape acquires too great a speed loops may form in the plenums and the reel servos may not be able to regain control of the tape tension when the OVERRIDE pushbutton is released. Under most circumstances, though, the tape will not attain too great a velocity during the normal 36 feet of clear leader and the OVERRIDE pushbutton may be released when opaque tape is in the plenums.



If the tape starts to form a large loop in one of the plenums during the override mode, either: a) if clear tape is in the plenums, release the OVERRIDE pushbutton, the tape transport will sense a broken tape condition, power will be removed from the transport and the string brakes will stop the reels; or b) if opaque recording tape is in the plenums, do not release the OVERRIDE pushbutton but immediately switch the POWER circuit breaker on the front panel of the system control bay to the OFF position and the string brakes will stop the reels.

1A-26. To pull long sections of clear leader through the plenums at the beginning or end of reel, proceed as follows. If the clear leader is at the end of reel and the reel is to be unloaded, omit steps a. and b.

- a. Load and thread tape on tape transport.
- b. Turn on main power circuit breaker on front on system control bay.
- c. Depress and hold the OVERRIDE pushbutton.
- d. Depress the POWER ON pushbutton.
- e. Continue to hold the OVERRIDE pushbutton depressed.
- f. Depress either the FORWARD, FAST FORWARD, REVERSE or FAST REVERSE pushbuttons depending on the desired direction of tape travel. The tape will accelerate in the selected direction. Hold the OVERRIDE pushbutton depressed until opaque tape is reached, then release the OVERRIDE pushbutton. If the tape attains a very high speed and a large loop starts to form in one of the plenums, follow the equipment power turnoff procedures listed in paragraph 1A-24. If a large loop does not form, releasing the OVERRIDE pushbutton while opaque tape is in the plenums will cause the tape transport to enter the drive mode at the selected tape speed.

1A-27. NORMAL/OLD STANDARD FM CENTER CARRIER FREQUENCY SELECTION. Either normal or old standard fm center carrier frequencies may be selected for each tape speed except 1-7/8 ips. Table 1A-2 lists the center carrier frequency selected for each tape speed for both the NORM and OLD STD positions of the selector switch.

Table 1A-2. Normal and Old Standard Fm Carrier Frequencies

TAPE SPEED IPS	CARRIER FREQUENCY	
	NORMAL	OLD STANDARD
60	108 kHz	54 kHz
30	54 kHz	27 kHz
15	27 kHz	13.5 kHz
7-1/2	13.5 kHz	6.75 kHz
3-3/4	6.75 kHz	3.375 kHz
1-7/8	3.375 kHz	(not used)

1A-28. PRINCIPLES OF OPERATION.

## 1A-29. GENERAL.

1A-30. In addition to the broken tape mode sensors, one light source and light sensor is located in each plenum chamber. These will be referred to as the inner sensors in contrast to the existing light sources and sensors which are called the outer sensors. The inner sensor is located so that when an 8 inch clear window passes through the plenum chamber light does not fall on both the outer and inner sensor simultaneously; but when a clear portion of tape longer than 8 inches passes, light falls on both the outer sensor and the inner sensor simultaneously. Refer to the logic diagram, figure 1A-3, and the wiring change diagrams for the tape transport and system control bay, figures 1A-4 and 1A-5.

## 1A-31. DESCRIPTION OF THE STANDARD BROKEN TAPE SENSING MODE.

1A-32. With the BROKEN TAPE MODE selector switch S15 in the STANDARD position, the tape transport will enter the broken tape mode (tape transport power turned off when a clear section of tape is sensed). When light falls on either of the outer sensors, as occurs when the tape breaks or when a clear window of any length passes, the light sensing circuitry causes relay K106, the broken tape relay, to become energized by allowing the +24V current to flow through normally open (NO) contacts K203-4 and 3, NO contacts K115-9 and 5, S15, through the coil of K106, through normally closed (NC) contacts K112-9 and 8, and through the light sensing circuitry to ground. With K106 energized, the tape transport power is turned off and the transport goes into the broken tape mode as described in Chapter 4 of this manual. In the standard broken tape sensing mode the inner light sensors have no effect and the broken tape or clear window sensing is handled entirely by the outer sensors.

**1A-33. DESCRIPTION OF THE IGNORE WINDOW BROKEN TAPE MODE.**

1A-34. With the BROKEN TAPE MODE switch S15 placed in the IGNORE WINDOW position, a clear section of tape less than eight inches in length is ignored. A section of clear tape shorter than 8 inches passing through the plenum chambers causes the outer sensors to sense light and the outer sensor circuitry completes the circuit on the ground side of relay K106. However, K106 does not become energized because the NC contacts K115-9 and 1 are open, (inner sensors not sensing light). Therefore, the tape transport operates normally, ignoring the less than eight inch window. When the inner sensor senses light, relay K115 becomes deenergized. With K115 deenergized, the current is able to pass through NC contacts K115-9 and 1, to K106 but since light is no longer falling on the outer sensor, the current is unable to complete a circuit to ground and so K106 is not energized. In effect, the clear section is ignored as it passes both the inner and outer sensors and the tape transport continues to operate normally.

1A-35. If the clear section of tape is longer than 8 inches, the outer sensor and the inner sensor sense light simultaneously and the tape transport enters the broken tape modes as follows: the +24V current flows through NC contacts K203-4 and 3, NC contacts K115-9 and 1, relay K106, the NC contacts K112-9 and 8, and the circuitry associated with the outer light sensor to ground. Thus, relay K106 is energized and the tape transport enters the broken tape mode.

**1A-36. DESCRIPTION OF THE SENSE WINDOW BROKEN TAPE MODE.**

1A-37. With the BROKEN TAPE MODE switch S15 in the SENSE WINDOW position, a clear section of tape shorter than 8 inches in length causes the tape transport to enter the stop mode. When the clear section of tape reaches the outer sensor, the circuitry associated with the outer sensor completes the circuit to ground and relay K113 becomes energized as follows: +24V flows through the NO contacts K203-4 and 3, through the NO contacts K115-9 and 5, switch S15, through relay K113, NC contacts K112-9 and 8, and through the outer sensor circuitry to ground. Current now flows through NO contacts K113-5 and 9 and charges capacitor C3. Capacitor C3 charges through the coil of K114 and the NC contacts of switches S1 through S6 to ground causing relay K114 to remain energized for approximately 1/2 second until C3 nears full charge. The NC contacts K114-1 and 9 are in series with the STOP switch S7 and when K114 is energized, these contacts open and interrupt the stop line thus producing the same effect as pressing the STOP button. The tape transport is now in the stop mode and awaits further commands. If the tape is moving fast the clear window may be pulled past the outer sensor and relay K113 becomes deenergized. The NC contacts K113-1 and 9 provide a discharge path for capacitor C3 through resistor R15. When the tape has come to a stop in this mode, it is possible to give the transport any mode command, but in order to prevent the transport from stopping again when the clear window passes the outer sensor it is necessary to hold the pushbutton down until the clear window passes onto either the upper or the lower reel. It may be seen that as long as any command button is held down it is impossible for K114 to give a stop command.

1A-38. When the transport is in this mode of broken tape operation, if a clear portion of tape longer than 8 inches passes the inner and the outer sensors, both will receive light simultaneously. In this case, the current will flow through the NO contacts K203-4 and 3, the NC contacts K115-9 and 1, relay K106, the NC contacts K112-9 and 8, and through the light sensing circuitry to ground, thus energizing relay K106 and placing the transport in the broken tape mode with the transport power turned off.

**1A-39. DESCRIPTION OF THE BROKEN TAPE OVERRIDE CIRCUITRY.**

1A-40. The reel servo circuitry utilizes a light beam passing through the plenum chamber in such a way that, if a clear section of tape longer than eight inches is pulled through the plenums, the servos react as if there is insufficient tape in the plenums, thus causing a loop to form in the plenum. Therefore, if it is desired to operate the tape transport using a long length of clear tape it is necessary to disable the reel servos and operate the tape transport in an open loop servo manner with the takeup reel motor exerting a constant torque and the supply reel exerting a constant holdback. This is what is accomplished when the OVERRIDE pushbutton S14 is pressed.

1A-41. While the OVERRIDE pushbutton is held down, relay K112 is energized and the NC contacts K112-9 and 8 are opened, thus disabling the broken tape circuitry. This allows the transport power to be turned on. The NC contacts K112-18 and 17 are open so that relay K110 is energized. This prevents relay K201, the reel drive relay, from energizing the reel motors. The transport is now ready to accept any mode command. No matter what command is given, relay K116 (override command), will be energized either through CR42 or CR43. When relay K116 energizes, the NO contacts K116-6 and 10 close thus causing relay K110 to be energized. The NO contacts K110-3 and 4 close, energizing relay K201 and the NO contacts K201-4 and 3 close, energizing the reel motor. The NO contacts K116-9 and 5 close, energizing relay K1 through NO contacts K112-6 and 7, and a NC contact of K1 breaks the circuit to the upper and lower servo brake. Another NC contact of K1 opens and separates the two reel motors electrically so that only one is able to run at a time. Thus, if a forward command is given, the 117 volt act current flows through a NO contact of K1, the jumper, the NC contacts K206-7 and 8, normally closed contact of K206 (pins 7-8), the lower reel motor (blue and yellow winding), a NC contact of K2 to the 117 volt ac common. The current also flows from pin 8 of K206 through capacitors C202 and C203, the lower reel motor (red and black winding), and a NC contact of K2 to the 117 volt ac common.

1A-42. If a reverse command is given, the 117 volt ac current flows through a NO contact of K1, the jumper, the NO contacts K206-7 and 6, the upper reel motor (red and black winding), and through a NO contact of relay K2 to the 117 volt ac common. Current also flows from pin 6 of K206 through capacitors C202 and C203, the blue and yellow winding of the upper reel motor, and a NO contact of K2 to the 117 volt ac common. It may be seen that K108, the reel reverse relay, is actuated during the broken tape override mode when the reverse command is given because NO contacts of K2 close allowing +24V to flow through a NO contact of K1, a normally open contact of K2, and the coil of relay K108 to ground. Whenever a reverse command is given, K102 closes so 28 volt ac current flows through the NO contacts K102-12 and 8, and the coil of K2 to 28 volt ac common thus energizing K2 whenever a reverse command is given. The NO contacts K112-14 and 15 close, in effect switching S12 to SEARCH. This means that if a fast command is given, the transport will actually go into the search mode.

**1A-43. MAINTENANCE.****1A-44. REEL SERVO ALIGNMENT.**

1A-45. GENERAL. The position of the tape in the plenum chambers is critical for proper operation of the inner light sensors in the sense window mode. Evidence of improper tape position may be: 1) a six inch clear section of tape causes tape transport power to be turned off; or 2) large loops of tape form in the plenums when stopping on clear leader.

**1A-46. PROCEDURE.** To correctly position the tape in the plenums, proceed as follows:

- a. Perform the reel servo alignment procedure contained in Chapter 5 of this manual using the ignore window mode or a reel of tape with no clear sections.

**NOTE**

If the tape transport will not handle tape with clear sections six inches in length when operating in the ignore window mode, the inner sensors may require adjustment. (See paragraph 1A-49.)

- b. At a tape speed of 60 ips adjust R1 of the photosensor so that the tape is positioned in the plenum so that there is approximately 1/4 inch between the tape and the black plastic inner sensor housing.

**1A-47. REEL EMERGENCY BRAKE ADJUSTMENT.**

**1A-48. GENERAL.** The reel emergency brakes are adjusted in the same manner as described in Chapter 5 of this manual. The results of the reel emergency brake torque test should be as listed in table 1A-3.

Table 1A-3. Reel Emergency Brake Torque Test

REEL	TORQUE	DIRECTION OF FORCE	FORCE IN OUNCES
Upper	Low	Clockwise	5 - 8 Ounces
Lower	Low	Counterclockwise	5 - 8 Ounces
Upper	High	Counterclockwise	40 - 48 Ounces
Lower	High	Clockwise	40 - 48 Ounces

**NOTE**

The bell crank spring has been removed in this application so the 40 - 48 ounces of high brake torque should be easily achieved without causing the brake to drag when the solenoid is deenergized.

**1A-49. INNER LIGHT SENSOR ADJUSTMENT.**

1A-50. GENERAL. If the inner light sensors are improperly adjusted, large tape loops may form in the plenums when a clear section of tape is pulled through the plenums in the ignore window broken tape mode.

1A-51. PROCEDURE. To adjust the inner light sensors, proceed as follows:

- a. Remove tape from tape transport.
- b. Turn on main power breaker switch. Do not turn on transport power.
- c. Cover the upper inner light sensor with tape.
- d. Pass finger or piece of opaque tape over the lower inner sensor. Relay K115 should energize each time the sensor is covered.
- e. Remove the tape from upper inner sensor.
- f. Cover the lower inner sensor with tape.
- g. Repeat step d. for upper inner sensor.
- h. If relay K115 does not energize each time either of the sensors is covered and then uncovered, remove the cover from the 1226965-01 amplifier assembly located on the relay bracket inside the system control bay.
  - i. Connect a dc voltmeter between pins 14 and 13 of the amplifier circuit board as shown in figure 1A-2. With one sensor covered and the other uncovered the reading should be less than 2 volts.
  - j. If the reading in step i. is not correct, remove the upper and lower plenum covers and the plenums.
  - k. Adjust the inner sensor lamp until a minimum voltage of below 2 volts is achieved.
  - l. Repeat step k. covering the others sensor and adjusting the lamp until a minimum voltage is achieved.

**NOTE**

The minimum voltage under most conditions would be less than 1 volt for each sensor.

- m. Replace plenums, plenum covers, disconnect voltmeter, replace amplifier cover, and remove any tape which is covering inner sensors. The tape transport is ready for operation.

**1A-52. SCHEMATIC DIAGRAMS AND PARTS LISTS.**

1A-53. A logic diagram, wiring change diagrams for the tape transport and system control bay, and parts lists are included in the following pages of this appendix.

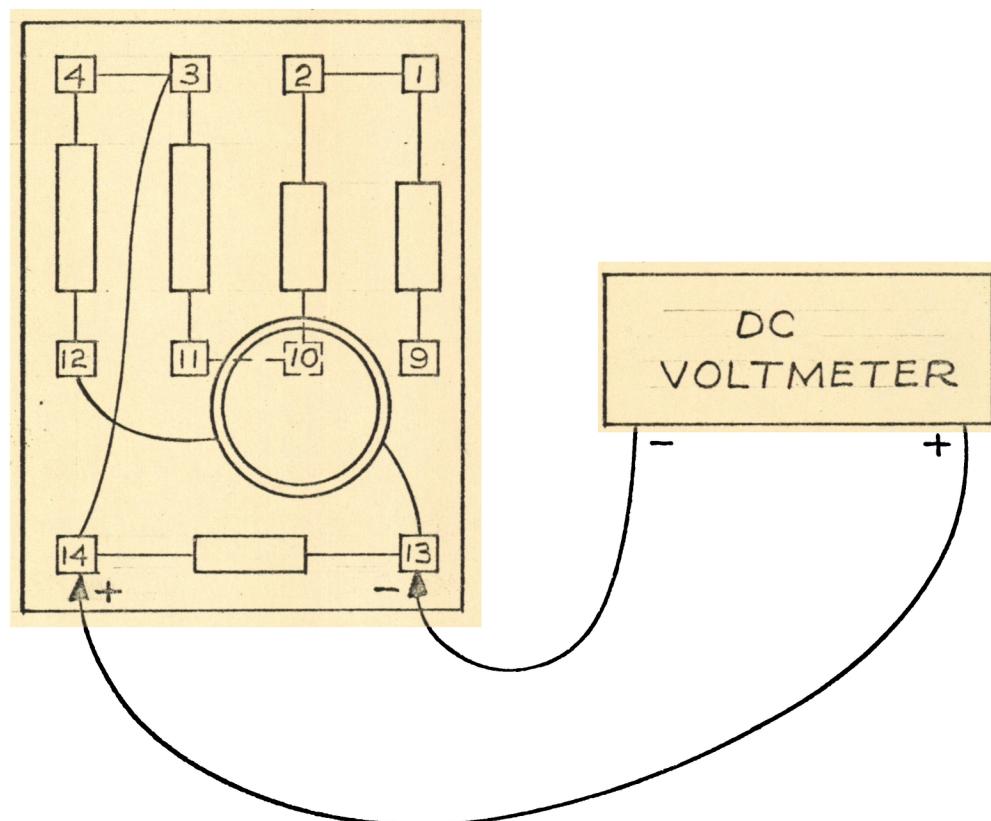
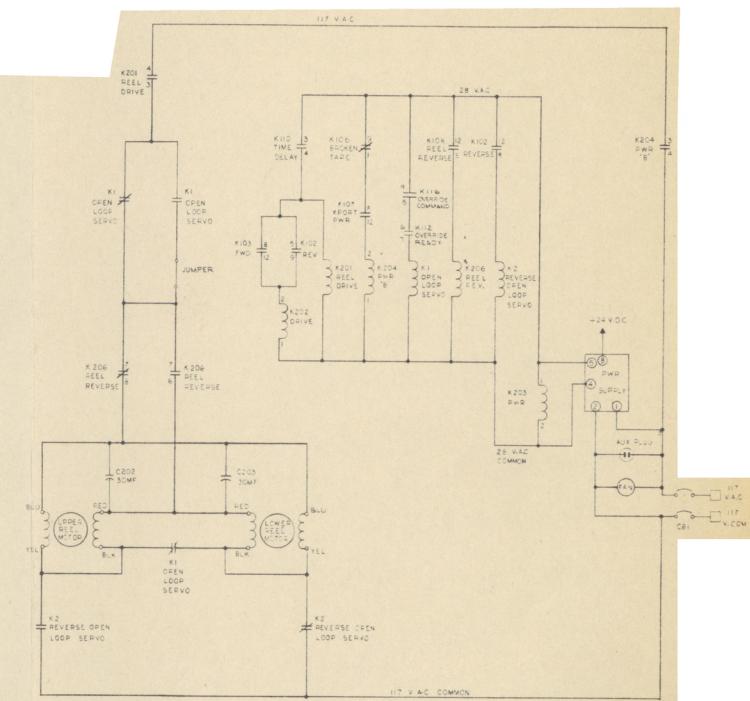
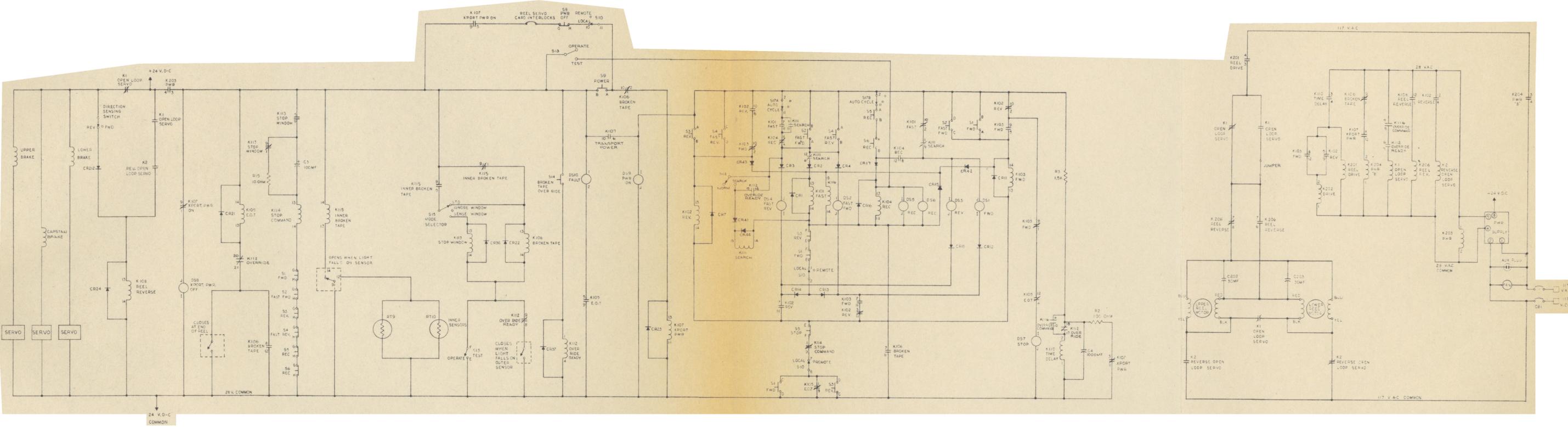
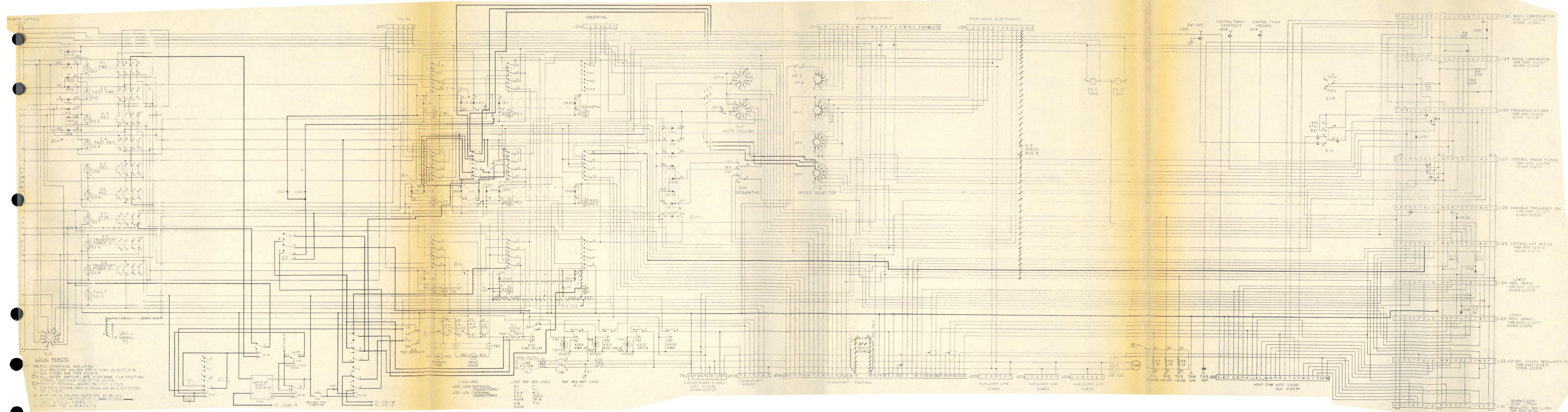


Figure 1A-2. Test Equipment Connection, Inner Light Sensor Adjustment

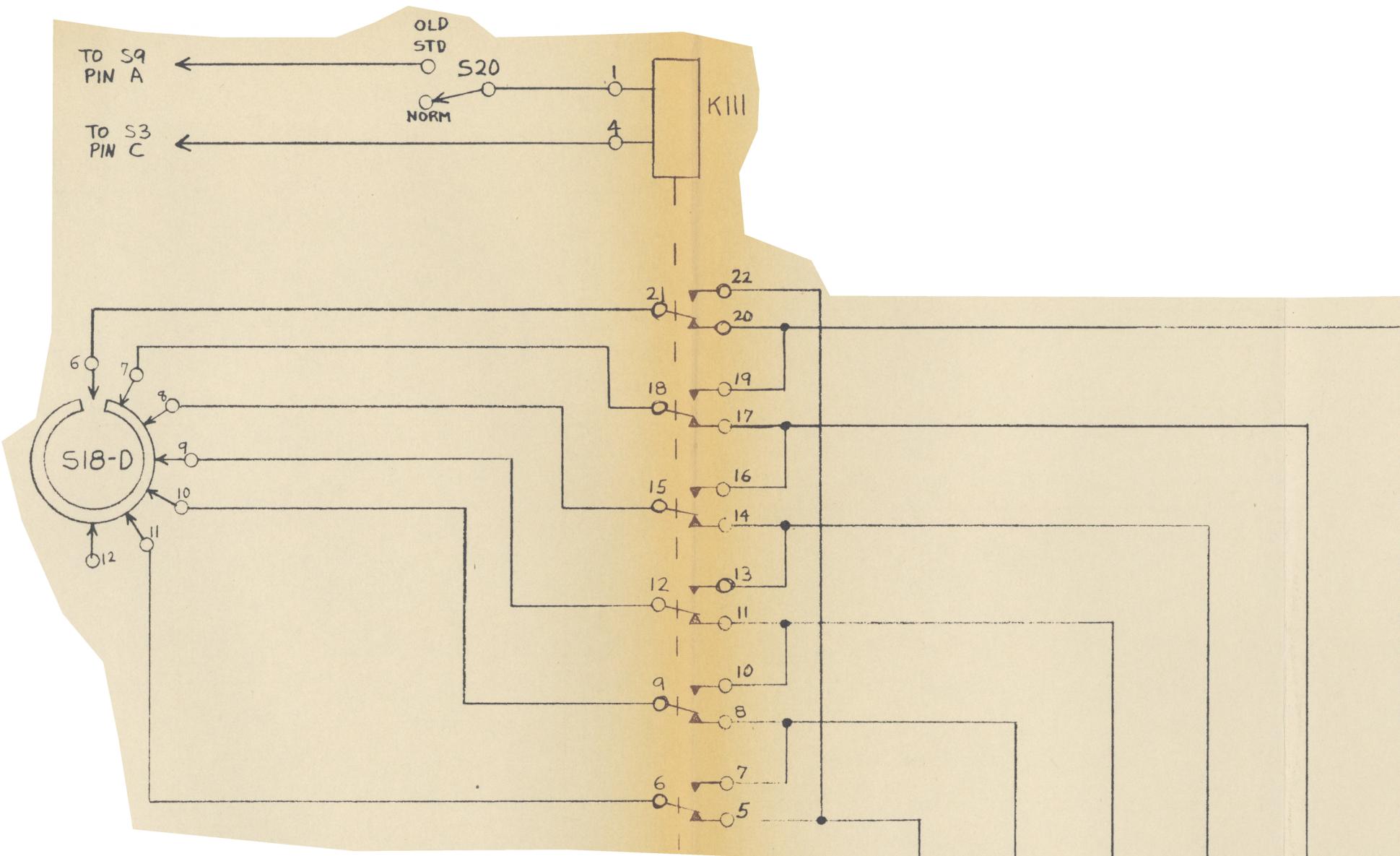


C-3561  
J1225534/B

**Figure 1A-3.** Simplified Logic Diagram, FR-1800L Recorder/Reproducer Modified for Three Modes of Broken Tape Sensing Ampex Catalog Number 1213689-07 Modified Per 1225540-01



## Range Diagram, FR-1800H System Modified for Three Modes of Range Sensing



NOTES:

1. THIS DIAGRAM REFLECTS CHANGES TO FIGURE 1A-4.
2. SWITCH S20 AND K111 ARE ADDED.

	A	B	C	D	E	F	J211
I <sub>PS</sub>	60	30	15	7½	3¾	1½	
f(KHz)	108	54	27	13.5	6.75	3.375	

ELECTRONICS  
POWER & CONTROL

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C1225502/-

Figure 1A-5. Wiring Change Diagram, FR-1800L System Control Bay with Normal/Old Standard Fm Center Carrier Frequency Selector Switch Ampex Catalog Number 1213689-Any Modified Per 1225500-01

NOTES:

1. LEGEND

— EXISTING WIRE

— ADDED WIRE

— DELETED WIRE

2. UNLESS OTHERWISE SPECIFIED

- A. ALL RESISTORS IN OHMS, 1/2 WATT
- B. ALL CAPACITORS IN MICROFARADS, 230 V
- C. ALL RELAYS SHOWN DEENERGIZED

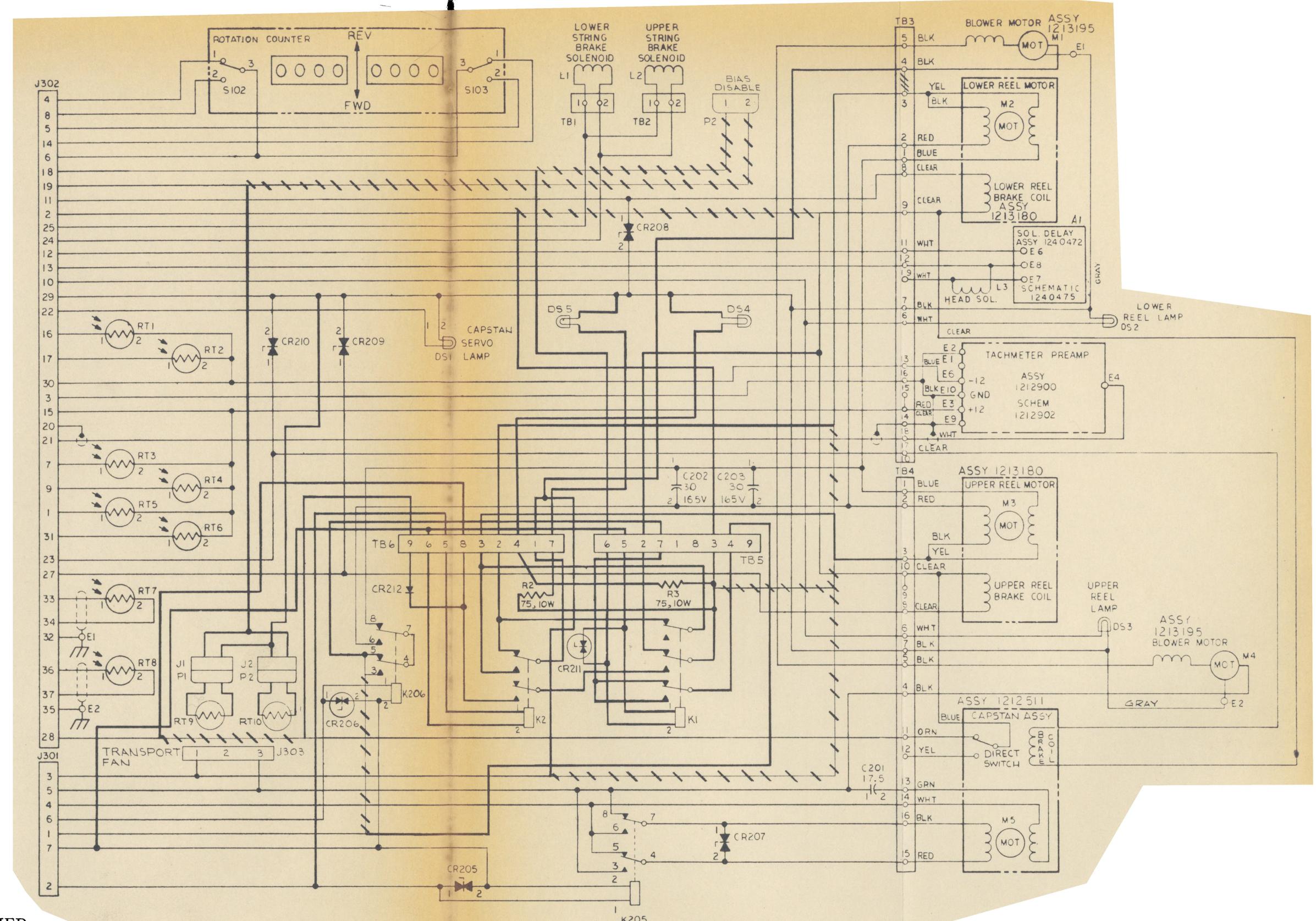


Figure 1A-1. Wiring Change Diagram, FR-1800L  
Tape Transport Modified for  
Modes of Broken Tape Sensing  
Ampex Catalog Number 1212500-17  
Modified Per 1225536-02

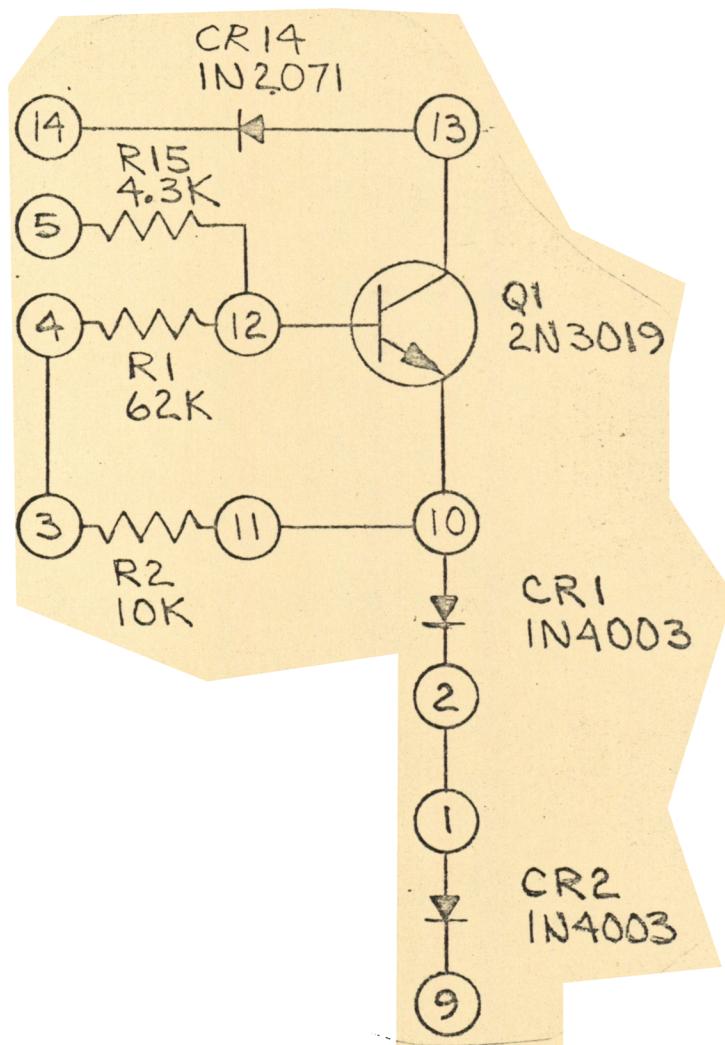


Figure 1A-7. Schematic Diagram, Amplifier Assembly X101  
FR-1800H System Control Bay  
Ampex Part Number 1226965-01

**PARTS LIST FOR: FR-1800H SYSTEM CONTROL BAY**  
 Ampex Catalog Number 1212531-08 Modified Per 1225531-01 and 1225500-01

REF. NO.	AMPEX PART NO.	DESCRIPTION	NO/ ASSY.
	1212531-08	CONTROL BAY ASSEMBLY	1
	1226965-01	AMPLIFIER ASSEMBLY	X101 1
	1222089-10	PLATE, Modification	A/R
	1225532-01	CONTROL PLATE	1
	1225534-01	WIRING CHANGE DIAGRAM	Ref
	1225535-01	BRACKET, Relay Mounting	1
	1225715-01	BRACKET SINGLE RELAY MOUNTING	2
	120-501	SWITCH, Toggle, SPST	S20 1
	013-154	DIODE, Silicon, 1N3279	CR36, 37, 41 thru 45 7
	020-144	RELAY, 4P2T, 24 vdc	K111, 113 thru 116 5
	020-365	RELAY, 6P2T, 24 vdc	K112 1
	031-729	CAPACITOR, Alum., 100 mfd, -10 +75%, 30 v	C3 1
	041-002	RESISTOR, Composition, 10 Ohms, 5%, 1/2 w	R15 1
	120-013	SWITCH, Pushbutton SPST N.O.	S14 1
	120-502	SWITCH, Toggle, 2P3T	S15 1
	150-119	SOCKET, Relay	6
	150-229	SOCKET, Relay	1
	302-061	CLIP, Cradle	C1 1
	302-067	CLIP, Extensible	N1 1
	471-606	SCREW, Truss Head, 6-32 x 1/4 Lg., SST	3
	503-316	WASHER, Flat, Non-metallic, Fibre	3

**PARTS LIST FOR: FR-1800H SYSTEM CONTROL BAY**  
 Ampex Catalog Number 1212531-08 Modified Per 1225531-01 and 1225500-01

REF. NO.	AMPEX PART NO.	DESCRIPTION	NO/ ASSY.
	700-531	SPACER, Post, 1/4 Sq. x 3 In. Lg.	3
	267-023	INSULATOR, Cap	2
	310-257	FASTENER, Wear Washer, Cupped	1
	435-001	RING, Retaining, Lock	1
	471-334	SCREW, Flat Head, #6-32 x 1/4 Lg.	2
	503-316	WASHER, Flat, Non-metallic	2
	471-606	SCREW, Truss Head, #6-32 x 1/4 Lg.	2
	700-531	SPACER, Post, 1/4 Sq. x 3 In. Lg.	2
	1222089-10	LABEL, Modification	2
	120-150	SWITCH, Toggle, SPST (NORM/OLD STD) S20	1
	150-229	SOCKET, Relay	1
	020-365	RELAY, 6PDT, 24 v	K111
	1225501-01	BRACKET, Switch Mounting	1

**PARTS LIST FOR: AMPLIFIER ASSEMBLY, X101**  
Ampex Catalog Number 1226965-01

REF. NO.	AMPEX PART NO.	DESCRIPTION	NO/ ASSY.
1	013-630	DIODE, 1N4003	CR1, 2
2	014-765	TRANSISTOR, 2N3019	Q1
3	041-415	RESISTOR, 62K Ohms, 5%, 1/4 w	R1
4	041-408	RESISTOR, 10K Ohms, 5%, 1/4 w	R2
5	020-129	HEADER, Relay	1
6	600-036	TUBING, Insulating	A/R
7	615-002	WIRE, Bare, #22 AWG	A/R
8	020-130	COVER	1
9	013-154	DIODE, 1N2071 or equivalent	CR14
10	041-012	RESISTOR, 4.3K Ohms, 5%, 1/2 w	R15

**PARTS LIST FOR:** FR-1800H TAPE TRANSPORT  
 Ampex Catalog Number 1212500-17 Modified Per 1225536-02

REF. NO.	AMPEX PART NO.	DESCRIPTION	NO/ ASSY.
1	1212500-17	TRANSPORT ASSEMBLY, 1-Inch Tape	1
2	1222089-10	PLATE, Modification	A/R
3	1225533-01	WIRING CHANGE DIAGRAM	Ref
4	1225537-01	RELAY CHASSIS ASSEMBLY	1
5	1225541-05	PLENUM ASSEMBLY, 1-Inch, Upper	1
6	1225541-06	PLENUM ASSEMBLY, 1-Inch, Lower	1
7	1225541-07	PLENUM ASSEMBLY, 1/2-Inch, Upper	1
8	1225541-08	PLENUM ASSEMBLY, 1/2-Inch, Lower	1
9	1225543-02	MOUNTING PLATE, Plenum	1
10	1225544-01	P.E. CELL ASSEMBLY	2
11	1225539-01	COVER, Chassis	1
12	1226401-01	MANIFOLD, Air	2
13	169-022	CONNECTOR, 2 Contact	6
14	173-070	TERMINAL, Standoff	4
15	470-042	SCREW, Cap, Socket Head, #10-32 x 1/4 Lg.	6
16	477-031	SCREW, Set, Cup Point, #4-40 x 1/4 Lg.	2
17	600-126	TUBING, Thermofit, 3/64, Clear	A/R
18	600-039	TUBING, Insulating, Black, #8	A/R
19	432-036	O-RING, 0.500 I.D. x 0.625 O.D. x 0.062 Thk.	4
20	440-092	PIPE FITTING, Plug, 1/8 Pt., Brass	2
21	600-468	TUBING, 3/16 O.D.	A/R
22	060-255	LAMP	2
23	130-048	LAMP HOLDER	2

**PARTS LIST FOR:** FR-1800H TAPE TRANSPORT  
Ampex Catalog Number 1212500-17 Modified Per 1225536-02

REF. NO.	AMPEX PART NO.	DESCRIPTION	NO/ ASSY.
24	290-009	BRACKET, Angle, 90°	2
25	600-031	SLEEVING, Clear, #9	A/R

**PARTS LIST FOR: RELAY CHASSIS ASSEMBLY**  
 Ampex Catalog Number 1225537-01

REF. NO.	AMPEX PART NO.	DESCRIPTION	NO/ ASSY.
1	1225538-01	CHASSIS, Relay Mounting	1
2	013-635	DIODE, Voltage Suppressor	CR211
3	020-411	RELAY, 4P2T	K1
4	020-427	RELAY, 2P2T	K2
5	043-339	RESISTOR, Wirewound, 75 Ohms, 3%, 10 w	R2, 3
6	180-059	TERMINAL STRIP, 10 Term W/Marker Strip	2
7	---	DELETED	-
8	260-058	GROMMET, Catipillar, Pipcat	1
9	310-162	FASTENER, Receptacle, #2	4
10	435-121	CRADLE CLIP, 0.625 Dia. x 1/2 Lg.	1
11	---	DELETED	-
12	013-154	DIODE, 1N3279, Diodes Inc. D1-56	CR212
13	296-011	CORD, Lacing, Black	A/R